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EGYPT

A COMPENDIUM

by

Raye R. Platt

and

Mohammed Bahy Hefny

with contributions from

John Kirtland Wright

and

David Lowenthal

with maps

AMERICAN GEOGRAPHICAL SOCIETY
Broadway at 156th Street
New York 32, New York

For limited distribution only

1958

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May, 1958

PREFACE

This compendium is designed to facilitate easy access to information of a comprehensive nature on the resources, economy, and external characteristics of the population of Egypt, together with the necessary background material. Not exhaustive on any subject, it represents an attempt to gather together, within the confines of a single volume, general information about a country for which little up-to-date material of a trustworthy nature is available.

The subject matter of the compendium can conveniently be divided into three parts. Part I (chapters 1 to 3) provides an historical and geographical introduction of Egypt and a description of the population today. Part II (chapter 4 through 7) deals with land and livelihood, the traditional economy of the country. Part III (chapters 8 through 12) deals with Egypt as a modern industrial and strategic power.

The volume was written jointly by Dr. Mohammed Bahy Hefny, Lecturer in Geography at Fouad I University (now Cairo University) and Raye R. Platt, Research Associate at the American Geographical Society and Editor-in-Chief of the Handbook Series. Dr. Hefny was responsible for the major part of the research on which the volume is based, the preliminary draft of most of the chapters, and the planning of the maps. Dr. John K. Wright, former Director of the Society, prepared the chapter on History, and Dr. David Lowenthal, Research Associate at the Society, the chapter on Egypt and the World. The cartographic illustrations were drafted by Lee Hunt and Victor B. Harris, Jr. of the Society's special cartographic staff. Miss Marion Hale, formerly of the staff of the Society, and Mrs. Marguerite Gardner typed the manuscript; the latter and Miss Rhoda L. Heinecke, both of the Society's staff, copy-read the final draft.

The Society wishes to express its thanks to the Embassy of Egypt, in Washington, and the Consulate General of Egypt and the Egyptian State Tourist Office, in New York, for generous assistance in obtaining source material; to the Societé Misr de Filature et de Tissage Fin en Coton Égyptienne at Kafi-El Dawar and the Societe Anonyme Égyptienne de Chaussures "Bata," at Alexandria, for supplying information on various phases of the Egyptian manufacturing industry; to the office of Al Ahram, Egypt's leading newspaper; and to Mr. Claude Boillot, of the New York office of the Suez Canal Company, for critical reading of an earlier draft of the chapter on the Canal.

A wide variety of sources has gone into the preparation of this compendium on Egypt. Statistical material on population growth and trends, the occupational structure of the population, land ownership and tenure, agricultural and industrial production, inland transport and communications, local and foreign trade, and economic and social conditions up to the revolution of 1952 was taken from the published reports of the decennial censuses (1797 to 1947), the triennial censuses of industrial production

(1945, 1948, and 1951), the voluminous Annuaire Statistique published by the Statistical Department of the government, the Annual Agricultural Census, and the official monthly Bulletin of Foreign Trade. The Economic Bulletin published monthly by the National Bank of Egypt offered current information on industrial and agricultural production and prospects, transportation, trade, and the like.

Especially valuable in evaluating the official statistics and reports were two critical studies of economic and social conditions in Egypt by Charles Issawi, an Egyptian social economist who has been for several years a member of the staff of the Department of Economic Affairs of the United Nations: Egypt, An Economic and Social Analysis, and Egypt at Mid-Century, An Economic Survey (Oxford University Press, Royal Institute of International Affairs, 1947 and 1954). Also useful were A Demographic Study of an Egyptian Province (Sharqiya), by Abbas Ammar, Lecturer-Designate in Geography and Anthropology at Fouad I University (now Cairo University) (London School of Economics and Political Science Monographs of Social Anthropology, No. 8, 1942) and Wendell Cleland's The Population Problem in Egypt: A Study of Trends and Conditions in Modern Egypt (Lancaster, Pa., and London, 1936).

These authorities express much doubt as to the accuracy of certain sections of the decennial census reports, Issawi and Ammar with respect to figures on births and deaths and on occupations and employment, Cleland on those relating to births and deaths. Except for districts where there are Health Offices maintained by the government, the official vital statistics fall far short of the actual facts. The figures on occupations and employment in the report of the 1947 census are also unreliable; the small amount of unemployment reported does not tally with other reports on the large body of unemployed industrial workers since the withdrawal of the Allied troops at the end of World War II.

One reason for these and other inaccuracies as Issawi suggests, is the difficulty of so wording a census questionnaire as to get accurate answers from a population that is 80 per cent illiterate. And Ammar remarks that as the result of "long periods of oppression, forced labor and ruthless conscription---people still look on census operations with apathy and suspicion," and, are apt to answer questions on employment, size of families, number of dependents, literacy, and other matters indicative of economic and social status in whatever way seems to give them the greatest security.

Issawi notes a general opinion in Egypt that the reported population of 1947 is considerably inflated and the growth between 1937 and 1947 of many of the urban centers of Lower Egypt, notably Cairo and Alexandria, is particularly open to question, although he recognizes that this may be at least in part due to the possibility that considerable numbers of the rural population who were attracted to these centers by the opportunities for employment provided by the Allied troops during World War II may have remained there.

The count of the population in the Egyptian censuses is a de facto enumeration, in which all persons present in a census district when the census is taken are counted, rather than a de jure enumeration in which only those actually resident in the district are counted (including those temporarily absent but excluding non-residents present when the census is taken). As Ammar explains, this may lead to much inaccuracy, particularly during religious festivals, when many people are away from their homes.

The triennial Census of Industrial Production provides a valuable check on the figures on occupations and employment in the 1947 census report. However, it does not include the small-shop and cottage industries that still account for a large proportion of Egyptian manufactures and provide employment for much of the "industrial" population. But comparisons of the 1948 and 1951 Censuses of Industrial Production with the report of the population census of 1947 do yield a fairly reliable estimate of the number of persons engaged in small-shop and cottage industry and their contribution to the total production of manufactured goods.

Whatever its other virtues or faults, the British occupation of Egypt was responsible for an exhaustive body of reports on the country's resources. Footnote references to these reports are to be found throughout this volume. Especially to be noted are the publications of the Survey of Egypt, outstanding among them the great two-volume work on the Geology of Egypt, by W. F. Hume, and those of the Physical Department of the Ministry of Public Works.

Probably no other river in the world has been the subject of such detailed study as was the Nile during the forty years of British occupation, when continuous effort was expended in making the fullest possible use of its water for the irrigation of the cropland of the valley and delta. In addition to the seven volumes under the general title The Nile Basin, by H. E. Hurst, R. P. Black, and Y. M. Simaika, and the sixteen-volume work under the same title by Hurst and P. Phillips, both published by the Physical Department of the Ministry of Public Works, there are a great number of separate Department Papers dealing with variations in the Nile flood, use of Nile water and plans for its control and conservation, and soils of the Nile valley and delta. These have been digested in Hurst's fascinating and readable The Nile: A General Account of the River and the Utilization of its Water (London, 1952).

For the economic and social condition of the predominantly agricultural population, two excellent studies from two different points of view were: The Fellahin of Upper Egypt: Their Religious, Social and Industrial Life, by W. Blackman, an Englishman of many years of residence in Egypt (London, 1927), and The Fellaheen, by H. Ayrout, an Egyptian (Alexandria, 1953).

For the activities of the present government that was set up after the forced abdication of King Farouk in the summer of 1952 and the proclamation of the republic on June 18, 1953, numerous booklets and pamphlets issued in English and Arabic by The Egyptian Bureau of Information and its Permanent Council for National Development have been useful. Appraisal of the reliability of progress reports is difficult, however. Up to July, 1956, the reports of these two agencies and articles in the Egyptian press indicated that the program of land reform and industrial development was being vigorously and successfully carried out, but since the nationalization of the Suez Canal, both official and non-official reports have dealt almost exclusively with international relations, rather than with domestic matters.

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1. HI TORY AND GOVERNMENT

INTRODUCTION

Civilization in Egypt is not only old but has endured throughout the ages with little change in some of its most fundamental aspects. These circumstances are due, in part at least, to the genial climate, the inherent fertility of the alluvial soils, their immense productivity when the system of irrigation is kept in order, and the protection afforded by the neighboring deserts and seas.

Long before the dawn of history peasant farmers were raising crops along the Nile. Like their descendants of today, they were tending the dikes and canals of an extensive and delicate irrigative system, and obeying rules intended to protect that system and to assure the equitable use of the life-giving waters. In the words of Professor Rostovtzeff, irrigation "demanded strict organization, unity, and skilled direction; it forced men to labor and to think; it made them subordinate themselves to directors and organizers. Both in Egypt and in Mesopotamia nature had created exceptionally favourable conditions for developing the kind of life capable of creating a real culture."[1] Or, as Ellen C. Semple put it: "It is not difficult to see, back of the astronomy and mathematics and hydraulics of Egypt, the far sweep of the rain-laden monsoons against the mountains of Abyssinia and the creeping of the tawny Nile flood over that river-born oasis."[2]

Whether civilization made its appearance earlier in Egypt than in Mesopotamia, the Indus Valley, or another of its so-called "cradles;" whether it was introduced into Egypt or blossomed there spontaneously; when a "real culture" with orderly government first took shape in Egypt - these are controversial questions that may be left to the archaeologists. It is certain, however, that in late prehistoric times, the bulk of Egypt's population consisted of peasant farmers, that there was also a ruling class of nobles, that small towns had come into existence, that some trade was being conducted with nearby Mediterranean peoples, that copper was being mined in Sinai, and that the art of writing was known; and, also, that in due course the whole of Egypt was brought under the rule of two kingdoms, one in the Delta and the other extending up the Nile valley to the First Cataract. The history of Egypt, as recorded in ancient written documents, "dawned" when, according to tradition, Menes, lord of the Southern Kingdom, unified the country probably sometime around the year 3200 B.C., or nearly 52 centuries ago.

H. R. Hall has pointed out that when Herodotus visited Egypt soon after the middle of the fifth century before Christ "the land stood open to foreign travellers, who could inspect the temples and all the sights of the country without difficulty or apparently the risk of fanatical objections."[3] The Greek historian's description of the religious observances and life of the people "is all the more interesting to us today because ... it might almost have been written today. Egypt was much the same then as she had been two thousand years before and as she is now."

Men's lives and fortunes change in Egypt as everywhere, but the larger changes are slow. If the dry climate checks the decay of material objects, the environment as a whole would seem to have had a preservative effect on human institutions, which helps account for "a capacity for conservation exceeding that of any other country in the world."[4] Mesopotamia, like Egypt, is a region where a very ancient civilization arose, based on the use of river water for irrigation, but unlike Egypt Mesopotamia has been exposed to invasions from every quarter and hence has experienced more radical displacements of its population and in general a more turbulent history.

"Settled early in one of the most fertile river valleys in the world, in a land devoid, with the exception of the river itself, of any striking natural features which might stimulate the imagination and encourage speculation," the Egyptians "led a life which was for most of them one unchanging round of agricultural pursuits. This fact colored all their activities and all their thought, and in particular made them perhaps the most conservative people the world has ever seen."[5]

This conservatism is most marked in the rural population. The implements and methods of cultivation that the <u>fellah</u> uses today, his outlook on life, and the main attributes of his character probably do not differ greatly from those of his ancestors when they were forced to leave their fields and labor on the Pyramids. All through the ages the Egyptian peasant, however much he may have grumbled, has tended to yield to exploitation and to suffer passively under misrule. An inherited tradition of millennia of submissiveness has usually inhibited him from rebelling against landlords and tax gatherers, despite the dire poverty that has been his lot in a land of riches derived primarily from his own exertions. Some have attributed this submissiveness to an innate "docility" or a "slothful temper."[6] It may be due in part to an inbred fear of the evil consequences of civil disorder upon an economy that depends so crucially upon the delicate mechanisms of irrigation. Whatever the cause, peasant rebellions and peasant movements have been rare in Egypt and when they have occurred they have been local rather than nationwide and hence have exerted few lasting effects. The leading events and the chief turning points in Egyptian history have been determined, not by the will of the masses, but by the actions of kings and ruling classes and by the impact of larger events in the outside world.

Deserts hem in the narrow ribbon of cultivated land along the Nile. Hence Egypt's principal historical contacts with the outer world have been effective only at the northern and southern ends of the country. The southern contacts, moreover, have been of critical importance during short periods only, as in the late eighth and early seventh centuries before Christ, when Ethiopians conquered Egypt, and also during the last hundred and fifty years. Throughout most of her history Egypt's relationships with the Sudan, though often interesting and productive, have exerted no decisive influence on Egyptian affairs, and the upper Nile valley has seemed like a "dead end street" terminating in an unexplored wilderness.

The external contacts of the north, by contrast, have been of vital consequence in shaping the course of Egyptian history. Here access to and from Asia, Europe, and the more westerly parts of North Africa is easy; here in times of weakness Egypt has been conquered from one or another of these quarters; and here in times of strength she has extended her own empire over Palestine, Syria, much of Arabia, parts of Asia Minor and North Africa, and to the islands of the Mediterranean.

For the purpose of the account that follows, the fifty-two centuries, more or less, of Egyptian history will be divided into four eras, unequal in length but well defined with respect to Egypt's relationship to the outside world. The first, that of Ancient Egypt, lasted some 28 centuries, from the unification under Menes to the conquest of the country by Alexander the Great (332 B.C.)

Were we to think of each century as a week in a calendar year beginning with Menes on "January 1," the period of Ancient Egypt would last until "mid-July." During by far the greater part of this long era Egypt maintained independence under her own native Pharaohs. In the second, or Greco-Roman era of nearly ten centuries (332 B.C.-640 A.D.), taking us to the third week in "September," Egypt came under European influences, ruled first by the Macedonian dynasty of the Ptolemies as a successor-state of Alexander's empire and after 30 B.C. as a province first of the Roman Empire and then of the East Roman, or Byzantine, Empire. The third, or Medieval era, opened with the conquest of Egypt by the Arabs and the introduction of Islam and closed 1158 years later ("December 20") with the occupation of the country by Napoleon Bonaparte. Asiatic influences were then in the ascendency: after about two centuries as a province of the Islamic Caliphate, Egypt gained a status of variable independence and semi-independence under Arab, Caucasian, and Turkish dynasties, until she became a province of the Ottoman Empire in 1517. The last, or Modern, era comprises the 155 years (less than a thirtieth of the whole span of Egyptian history) that have elapsed since Bonaparte's invasion in 1798 put Egypt in the central arena of European and of global politics and aroused in her people the spirit of modern nationalism.

ANCIENT EGYPT, CA. 3200-332 B.C.

All that the word "Egyptian" suggests most distinctively in the realms of religion, monumental architecture, and decorative art dates from this era, which has also been called the "Pharaonic" or "Dynastic" Age. About a generation after Alexander's conquest, when Ptolemy II was on the throne, an Egyptian priest and historian, Manetho, classified the kings since Menes by dynasties. According to this scheme there were thirty dynasties in all (thirty-one, if the second Persian domination (341-332 B.C.) be counted as a separate dynasty), 25 of native Egyptians and 5 of non-Egyptian conquerors (XV, XVI, Hyksos; XXII, Libyans; XXV, Ethiopians; XVII, Persians). Although modern researches have shown that Manetho's dynasties are none too accurate, they are widely used as a convenient means of identification.

During the era of Ancient Egypt the state passed through three major cycles, in each of which a more or less regular sequence of events occurred. At first strong kings would bring the country ever more effectively under their control until a culminating epoch of unity, efficiency, and prosperity was reached. In these propitious times the irrigation system was kept in good order, improved, and augmented; the fruits of Egypt's soil were reaped in full measure, the country prospered, the population grew, mighty architectural structures and works of engineering were built, art and literature flourished. Then a decline would set in; the control of the central administration over the local governors would be loosened and finally lost completely; in the general disintegration the irrigation system would be neglected, and there would follow widespread poverty, famine, and a decrease in population. When the lowest ebbs were reached, foreign aggressors would march in, lured by Egypt's potential riches.

The curve of Egypt's fortunes thus rose to a peak and fell to a low point in each cycle, and the history of Ancient Egypt may, accordingly, be divided into six epochs, during the first, third, and fifth of which the curve stood high and during the second, fourth, and last of which it stood low:

FIRST CYCLE	I.	Archaic Period (3200-2680 B.C.) and the Old Kingdom (2680-2258 B.C.) Dynasties I-VI. 942 years.
	II.	First Intermediate Period. Dynasties VII-X. 206 years c. 2258-c. 2052 B.C.
SECOND CYCLE	III.	The Middle Kingdom. Dynasties XI-XII. 266 years c. 2052-c. 1786 B.C.
	IV.	Second Intermediate Period. Dynasties XIII-XVII. 216 years c. 1786-c. 1570 B.C.
THIRD CYCLE	V.	The New Kingdom. Dynasties XVIII-XX. 485 years c. 1570-c. 1085 B.C.
	VI.	The Decadence. Dynasties XXI-XXX. 753 years c. 1085-332 B.C.[7]

Within each of the eras of increasing strength (i.e., the earlier stages of I, III, and V) there were temporary breakdowns of governmental authority, and similarly temporary recoveries of strength and power occurred in each of the eras of recession. The "Decadence," as we shall see, was a long and complex period when the downward trend was general but by no means uninterrupted. The dates and durations of the periods, though given in years with seeming precision, are approximate only, especially for the first two cycles. The whole matter of Egyptian chronology is uncertain down to about 1000 B.C.

As yet the radio-carbon method of dating has not been sufficiently refined, nor have enough samples from ancient Egypt been dated by that method, to shed much light on this subject. The dates thus determined under Dr. W. F. Libby's direction at the Institute for Nuclear Studies, University of Chicago, apply to samples of wood from three tombs of the First, Fourth, and Twelfth Dynasties, respectively, and correspond well with the approximate dates to which they have been recently assigned by the Egyptologist, Dr. J. A. Wilson, on the basis of other evidence. On the other hand, the "radio-carbon" date of a sample from a tomb of the early Third Dynasty is several centuries later than the otherwise "known" date - later, in fact, than the radio-carbon date of the Fourth Dynasty tomb.

The First Cycle, c. 3200-c. 2052 B.C.

For several centuries after the unification the historical record is obscure. Egypt would seem to have prospered under the Pharaohs of the First and Second Dynasties, whose seat of government was in the Delta. With the transfer of the capital to Memphis (c. 2780 B.C.), Egypt's first great age, that of the so-called "Old Kingdom" opened, and it reached its culmination in the Fourth and Fifth Dynasties (2680-2420 B.C.). Absolute monarchs, who were worshipped as gods, brought into effect "an elaborate development of state functions under local officials, such as was not found in Europe until far down in the history of the Roman Empire." The country since prehistoric times has been divided into districts or nomes, each administered by a local governor or nomarch. Besides the the centralized bureaucracy, in which the nomarchs were the leading officials, there was also a large class of landholding nobles, who lived lives of luxury on their great estates.

> "Some five centuries of uniform government, with centralized control of the inundation, in the vast system of dikes and irrigation canals, had brought the productivity of the nation to the highest level; for the economic foundation of this civilization in the Old Kingdom, as in all periods of Egyptian history, was agriculture ... the enormous harvests of wheat and barley gathered by the Egyptian from the inexhaustible soil of his valley."[8]

One of the earliest maritime ventures on record was made about the beginning of the Fourth Dynasty when the Pharaoh Snefru sent a fleet of forty vessels to the coasts of Phoenicia to fetch cedar logs from the forests of Lebanon. During the Fifth Dynasty Pharaoh Sahure dispatched an exploring and trading expedition to an even more distant goal - the land of Punt at the southern end of the Red Sea - and it brought back a cargo of myrrh, electrum, and a "costly wood" that may have been ebony.

The Old Kingdom, however, is remembered chiefly for the Great Pyramids. These immense structures, standing not far from the present

site of Cairo, were built during a relatively short period as tombs for the Pharaohs of the Fourth Dynasty (2680-2565 B.C.). The Pyramid of Khufu (Cheops), "the greatest mass of masonry ever put together by human hands,"[9] rises to a height of 470 feet above a square base 755 feet to the side. According to Herodotus, whose account seems credible, 100,000 laborers worked on it for twenty years. The pyramid contains 2,300,000 blocks, each weighing on an average two and a half tons. They were quarried on the opposite side of the Nile and floated to the base of the pyramid hill during the high stages of the river, and thence dragged up the slope on a huge ramp. So careful and skilled was the work that "blocks weighing tons are set together with seams of considerable length, showing a joint of one ten thousandth of an inch."[10] Next to the east side of each pyramid stood a mortuary temple in which "a richly endowed priesthood was ... employed to maintain its ritual and to furnish the food, drink, and clothing of the departed king."[11] The Great Sphinx is a portrait of one of the Pharaohs of the Fourth Dynasty, possibly Khafre.

A modern scholar, R. Engelbach, has ingeniously suggested that the Pharaohs undertook the construction of the Great Pyramids to provide work relief for an undernourished surplus peasant population. Although Professor Wilson believes this to be an unwarranted projection of an ultra-modern concept back into the distant past, he points out that something akin to work relief was a "derivative product." "A major endeavor of pyramid construction was at the period of high Nile, when the great blocks of stone could be floated from the quarries to a point near the pyramid plateau. The period of high Nile was the low point of the year from the standpoint of crop production, that time when ... the granaries of last year were at their lowest. When the state drafted labor at such a time and had to feed its workers, the workers enjoyed a small dietary relief. But the purpose of the work was solely the service of the god-king, and the labor was undoubtedly conscripted and worked to the last pound of energy."[12]

"A Pharaoh of power, force, and ability, and loyal governors in the nomes, meant a strong state; but let the Pharaoh betray signs of weakness and the governors might gain an independence which would threaten the dissolution of the whole."[13] This, indeed, is what happened. In the course of time the nomarchs succeeded in establishing themselves as semi-independent, landed barons, who overthrew the Fifth Dynasty, and one of the factors which brought about the breakdown was unquestionably their resentment against the Pharaohs for absorbing so much of the human and material resources of the state in unproductive pyramid building. After a revival of the central authority, complete collapse followed at the close of the Sixth Dynasty, and during the "First Intermediate Period," which followed, the Delta appears to have been overrun by barbarous Asiatic tribesmen.

How long this obscure "intermediate period" lasted and the nature of the invasion are but dimly understood, but one may be sure that these early intruders did not come in as disciplined armies of an organized government, but were more like the wandering hordes that broke into the crumbling Roman Empire twenty-five centuries later. As long as Egypt could maintain

her internal cohesion, with even a small defensive force she had little to fear from enemies of this kind, or indeed from any external enemies, until many centuries later. Far away behind desert barriers in the Tigris and Euphrates valleys, the nearest organized state was neither close enough nor powerful enough to be a menace. The strong Pharaohs of the Old and Middle Kingdoms, unworried by the spectre of hostile attack, could devote their resources to colossal engineering and architectural enterprises. The Great Pyramids are not only impressive monuments to the kings who built them; they are even more imposing as monuments to an age of peace and security.

The Second Cycle, c. 2052-c. 1570 B.C.

At the close of the First Intermediate Period a vigorous line of Theban princes brought the local lords partially under control in a feudal organization that remained in effect during the time of the Middle Kingdom. The mighty Pharaohs of the Twelfth Dynasty, however - the Amenemhets and Senusrets (Sesostrises) - further curtailed the powers and pretensions of the feudal barons. For some thirteen centuries, until it was sacked by the Assyrians in 663 B.C., Thebes remained Egypt's preëminent city.

Ancient Egypt may well have reached its peak of prosperity and well-being under the Middle Kingdom. Though pyramids were still built, they were made of brick and were much smaller than those of the earlier age. "More wholesome views of the function of kingship have by now gained the ascendency and the resources of the nation are no longer absorbed in the pyramid."[14] They are devoted, rather, to enterprises of public benefit. To enable vessels to bypass the First Cataract, Senusret III had a canal cut through the granite rock. According to the Greeks one of the Senusrets constructed a canal from the Nile to the Red Sea. Amenemhet III did much to improve irrigation. "His officials ... at the second cataract had instructions to record the height of the Nile on the rocks there ... Such observations, communicated without delay to the officials of lower Egypt in the vizier's office, enabled them to estimate the crops of the coming season and the rate of taxation was fixed accordingly."[15] In the Faiyum, huge projects of irrigation, reclamation, and drainage were put into operation and brought some 27,000 acres under cultivation. Here "the rich and flourishing province recovered from the lake was doubtless a royal domain, and there are evidences that it was a favourite place of abode with the kings of the latter part of the Twelfth Dynasty."[16] An immense building was erected in the Faiyum to serve as an administrative and religious headquarters for the whole kingdom. Still standing in Strabo's time (c. 17 A.D.), it was called the Labyrinth and regarded as one of the wonders of the world.

Unlike the Old and New Kingdoms, the Middle Kingdom is not represented today by any noteworthy monuments of architecture. It has, however, bequeathed to us a remarkable heritage in the form of jewelry and other products of the arts and crafts and a literature that bears witness to a "rich and varied life."[17] Model letters for study by schoolboys have been preserved and also folk tales (among them one not unlike the story of Sinbad

the Sailor), and the literature in general "displays a wealth of imagery and a fine mastery of form."[18]

During the "Second Intermediate Period," the dark age of disintegration that followed the decline of the Middle Kingdom, "there came unexpectedly men of ignoble birth out of the eastern parts, who had boldness enough to make an expedition into our country, and easily subdued it by force without a battle."[19] These "ignoble"folk of whom little is known, were called the Hyksos, a term mistakenly translated as "Shepherds." Their movements may have been set in motion by the westward push of Indo-European tribes across Asia, and they had established rule over Syria. Their conquest of Egypt was made all the easier by the use of new instruments of war, which no doubt brought terror to the Egyptians - the horse, the chariot, body armor, and the composite bow. The Jewish historian Josephus sought to equate the Hyksos with the Children of Israel, and others have thought that their invasion of and expulsion from Egypt may be reflected in the accounts given in the book of Genesis of Abraham's and Jacob's journeyings and in Joseph's assertion that "every shepherd is an abomination unto the Egyptians" (Gen. 46:34). What connection, if any, there may have been between Israelites and Hyksos, however, lies wholly in the realms of conjecture, as do also the questions of which Pharoah Joseph served and of when Moses led the children of Israel out of Egypt.

The Third Cycle,c.1570-332 B.C.

The New Kingdom, or The Empire,c.1570c.-1085 B.C.

After a century or more of subjection, the Egyptians at the end of the Seventeenth Dynasty (1600-1570 B.C.) again revolted under Theban leadership, drove out their oppressors, and emerged from the war of liberation as a military power. The pharaohs now had a well-equipped, well-disciplined standing army under their command, which they used to put down opposition within the country and eventually to extend their rule over outlying territories. During the early years of the new era the monarchy deprived the feudal lords of their powers and confiscated their lands, and all Egypt became essentially "the personal estate of the Pharaoh."[20] Ahmose I (1570-1545 B.C.), first Pharaoh of the famous Eighteenth Dynasty, pursued the Hyksos into Asia, and his equally virile and energetic successors, Amenhotep I, Thutmose I, and in particular Thutmose III carried on a long series of wars, which brought Syria under Egyptian rule and pushed the southern frontier up the Nile in Nubia nearly to the Fourth Cataract. Thutmose III (1504-1450 B.C.), who conducted no fewer than seventeen campaigns in Asia during nineteen years, was unquestionably a military genius and empire builder. Professor Breasted likened him to Alexander or Napoleon, perhaps overenthusiastically. His adversaries' armies could hardly have been as evenly matched with his as were those of Napoleon's enemies with the armies of the French.

Earlier Pharaohs had occasionally conducted military operations outside the borders of Egypt proper. These were punitive or plundering raids and did not result in the long-lasting annexation of large areas. Thutmose III, however, founded a genuine outlying empire, which endured - though not altogether continuously - for about 400 years and from the subjugated princes of which the

Pharaohs received allegiance and tribute. The establishment of the Empire, moreover, wrought a profound change in the whole character of Egyptian life. Previously Egypt "had been an overgrown folk society," relatively simple, unified, rural, and isolated. It now became "a cosmopolitanized and urbanized society, diffused and heterogeneous..." [21]

Added to the agricultural riches extorted from the peasants and the mineral riches derived from the gold mines of Nubia and the copper mines of Sinai, the imperial tribute brought immense wealth into the treasury of the Pharaohs, which they used for their own glorification and for the glorification of the gods. The monuments of architecture that have been preserved from this period consist almost exclusively of tombs and temples.

One of the most interesting of the temples, known today as "Der el-Bahri," stands against the cliffs on the western side of the Nile Valley at Thebes. It was erected by Queen Hatshepsut, "the first great woman in history ..."[22] This remarkable woman had sufficient character and backing not only to make herself co-regent with Thutmose III during the earlier years of the latter's long reign, but to push him aside temporarily and herself rule the country. She had the temple built in response to a command of the oracle of Amon that she should "establish for him [Amon] a Punt in his house."[23] To this end she dispatched to the land of Punt a fleet of five vessels, which may have used the canal that one of the Senusrets is reputed to have built from the Nile to the Red Sea. The expedition took with it a stone statue of Hatshepsut to be set up in Punt and brought back a large cargo of exotic products:

> "all goodly fragrant woods of God's-Land,
> heaps of myrrh-resin, of fresh myrrh-trees
> with ebony and pure ivory, with green gold
> of Emu, with cinnamon-wood, with incense,
> eye-cosmetic, with baboons, monkeys, dogs,
> with skins of the southern panther, with natives
> and their children. Never was the like of this
> brought for any king who has been since the
> beginning." [24]

The events of the expedition are recorded in reliefs on the walls of the temple, showing among other things the departure of the vessels and the loading of the cargo.

This temple is in the direct tradition of the mortuary chapels which, as we have seen, were built close to the east sides of the Great Pyramids. By Hatshepsut's time the custom of erecting pyramidal tombs had been abandoned, and the royal remains were now interred in chambers dug deep into the rock walls of the Valley of Kings. The practice, however, of maintaining a mortuary chapel or temple to the eastward of each tomb had persisted, although a distance of some two miles now separated the tombs in the Valley from their associated temples on the plain.

During the reign of Amenhotep III (1410-1372 B.C.), whom Professor Breasted styled "the Magnificent," the Empire reached its apex. This Pharaoh is commemorated in two gigantic statues which tower high above the western plain at Thebes and were mistakenly called the "Colossi of Memnon" by the Greeks. Amenhotep III and his son Amenhotep IV carried on an extensive diplomatic correspondence with their vassals in Syria and Palestine and with the kings of Babylonia, Nineveh, Cyprus, and Mitanni. Some three hundred of the letters, which though written on clay tablets in the Babylonian cuneiform have a decidedly modern flavor, were discovered in 1888 at the capital city of Amenhotep IV, the Tell el-Amarna of today, "from which the correspondence takes its name."[25]

In the reign of Amenhotep III the Egyptians came into conflict with another organized state of equal, or perhaps even superior, military potential, the empire of the Hittites, who had established themselves in eastern Asia Minor. While Amenhotep III was still on the throne these folk overran his northernmost dependencies in Asia, and the Pharaoh did not follow the example of his more militant predecessors by personally leading his armies against them in a war of reconquest. His son, Amenhotep IV, more interested in religious reforms than in warfare, lost the whole of the Asiatic domain to the Hittites and their allies.

The gradual decline in strength that began at the time of Amenhotep III was temporarily reversed during the reigns of Seti I and Ramses II of the early Nineteenth Dynasty and of Ramses III of the early Twentieth. Ramses II, who ruled for sixty-seven years (1301-1234 B.C.), recovered about a quarter of Egypt's former Asiatic empire in the course of fifteen years of campaigning finally brought to an end about 1280 B.C. by a treaty with the Hittites. This agreement, the text of which was engraved upon two silver tablets, was reached after "the Egyptians and the Hittites" had come to recognize "the futility of expending against each other energies which had to be saved against the encroachments"[26] of new mutual enemies who were appearing on the northwestern horizon at this time: "peoples whose ultimate destinies were to be in Europe as Greeks and Latins. These new peoples [during the centuries from 1400 to 1100 B.C.] were gradually streaming out of some northeastern Indo-European home and were slowly building up their challenging strength in the coastal regions of the eastern Mediterranean. The Egyptian texts called them 'the northerners in their islands,' and we shall call them the Sea Peoples. In their thrust for new homes they were to damage irreparably the balance in the ancient orient and were to bring new and significant forces into being in Europe."[27]

The long-drawn-out Hittite wars were prophetic of disasters to come, when Egypt fell a victim to even stronger Asiatic powers. Equally portentous in the reign of Merneptah, Ramses II's immediate successor, was Egypt's narrow escape from conquest by Libyans from the west in alliance with the new European Sea Peoples.

No scene in all the world has been pictured more often than that of the Great Pyramids and Sphinx. Hardly less familiar to every school child are views of three stupendous architectural monuments, each dating for the most

part from the reign of Ramses II: the cliff temple of Abu Simbel in Nubia with four colossal statues of that king adorning its façade, the columns of his mortuary temple near the western cliffs at Thebes (the "Ramesseum"), and the gigantic colonnaded hall of the Great Temple of Amon, across the river (Karnak).

The immensity of these temples bears witness to an imbalance which accounts in part for the weakening and ultimate breakdown of the monarchy. Under the Old and Middle Kingdoms priestly functions had been performed largely by lay nobles as "incidental offices." With the elimination of the feudal regime and establishment of the empire the priests emerged as a favored professional class, and especially favored among them were the High Priests of the Temple of Amon in the capital, Thebes. With the wealth and authority that the Pharaohs bestowed upon them, these priests brought the various local priesthoods under their authority.

Once, but only once, did any Theban Pharaoh venture seriously to oppose the mighty ecclesiastic organization thus developed. The brilliant and mystical Amenhotep IV sought to substitute the worship of Aton, the sun's disc, for that of Amon, the ancient Theban god. Taking the name Ikhnaton, "Spirit of Aton," he dispossessed the priests of Amon and built a new capital at the present site of Tell el-Amarna, some 300 miles to the north of Thebes. Ikhnaton's hymns have been preserved and remind one of the Psalms. Through him "a new spirit has breathed upon the dry bones of traditionalism in Egypt ... He grasped the idea of a world denominator, as the creator of nature, in which [he] saw revealed the creator's beneficent purpose for all his creatures, even the meanest." [28] His idealism, with monotheistic overtones, was too far in advance of his time. His loss of the empire in Asia alienated the military, which had given him support, and his religious reforms won him the enmity of the priesthood. His immediate successors, two sons-in-law, Sakere and Tutenkhaton, maintained the worship of Aton for a few years, but the priests of Amon forced the latter to permit resumption of Amon worship and then to change his name to Tutenkhamon, "Living Image of Amon." This poor young king's tomb, when opened in the winter of 1922-1923, revealed splendors that astonished the world.

Thereafter, the supremacy of the established priesthood of Amon remained unquestioned, and the priests acquired a growing economic and political influence. The Pharaohs saw to it that the holdings of the temples were exempted from taxation and that much of the nation's wealth was diverted to the support of the priests. "The state was thus ... gradually distorted to fulfil one function at the expense of all the rest, and its wealth and economic resources were ... slowly engulfed, until its industrial processes [became] but incidents in the maintenance of the gods." [29]

Ramses III (1195-1164 B.C.), last great Pharaoh of the New Kingdom, was followed by a succession of weaklings (Ramses IV-XI, 1164-1085 B.C.). Under their feeble rule, the Asiatic empire was lost for good, and the Priesthood of Amon built up a political strength that came to exceed that of the Pharaohs themselves, until finally Hrihor, a soldier who had assumed

the role of the High Priest, brought the Twentieth Dynasty to a close by himself seizing the throne.

The Decadence, c. 1085-332 B.C.

With this event Egypt entered a stage comparable in some ways to the two intermediate periods, an era in which internal dissension laid the country open to successive invasions. The Decadence lasted much longer (some seven and a half centuries), its history was far more complex, and it was not followed, like each Intermediate Period, by a resurgence of independence and glory under native Pharaohs. Before the Decadence Egypt had been independent almost continuously. During that age native Egyptians ruled over the country for only about a third of the time, and since then, until the twentieth century, the Egyptian people have never enjoyed independence in the fullest sense.

The 135 years of the Twenty-First Dynasty (1085-950 B.C.), sometimes called the Tanite Period, were a time when authority was divided between a line of petty merchant princes at Tanis in the Delta and the Priesthood of Amon at Thebes. It was an epoch of "poverty and indiscipline," during which the country lay "torpid and inactive."[30] By this time the military spirit of the Egyptians had been almost completely lost and the kings had come to place reliance upon mercenaries. Many of these were Libyans, recruited from among the people who dwelt immediately to the west, along the Mediterranean coast, some of whom had migrated into the Delta in considerable numbers. About the year 950 B.C. an energetic Egyptianized Libyan mercenary leader, Sheshonk, "gained the crown of Egypt without so much as drawing the sword"[31] and established a Libyan dynasty (Manetho's Twenty-Second). Meanwhile, far up the Nile at Napata between the Third and Fourth cataracts in Nubia, an Ethiopian monarchy had arisen under part-Negro, part-Libyan kings. After the Libyans had ruled over Egypt for some two centuries (950-730 B.C.), the central authority again broke down, and the Ethiopians pushed down the Nile and established a new and vigorous dynasty of their own (Twenty-Fifth), which endured for about seventy years (730-663 B.C.).

Under these Libyan and Ethiopian pharaohs Egypt was ruled by foreigners, to be sure, but by fellow Africans who had become Egyptianized in culture and religion. The later invaders seemed more alien and hence were more offensive to Egyptian sensibilities. The Assyrians first intervened in Egypt in 675 in retaliation for intrigues which the Ethiopian Pharaoh Tarhaka had been carrying on against them in Syria. In 671 Esarhaddon undertook a full-scale invasion. After his death, Tarhaka regained control, but in 667 Ashurbanipal reconquered the country. Four years later the Assyrians sacked Thebes (663) and treated that venerable city so grievously that it never recovered its former prestige. By this time riding for a fall in Asia, the Assyrians were in no position to maintain a strong grip on Egypt, and when Ashurbanipal finally withdrew in 663, he did not place Egypt under an Assyrian governor, but left a native Egyptian, Psamtek (Psammetichus), in charge. It was not long before Psamtek threw off the Assyrian yoke and set himself up as Pharaoh - the first of the Twenty-Sixth Dynasty.

From the town of Saïs in the Delta, this dynasty ruled for nearly a century and a half (663-525 B.C.) over a once-again free and united nation, and the period has come to be known as that of "Saïte" Egypt. It was a time of considerable enterprise and prosperity. Necho, second Pharaoh of the dynasty, not only sought to restore the ancient canal from the Red Sea to the Nile but is said to have sent out an exploring expedition which circumnavigated Africa. Herodotus tells the story of the three years' voyage from the Red Sea to the Pillars of Hercules and of how, during the return, the sailors had the sun upon their right hand - an observation that Herodotus himself disbelieved but which may bear witness to the truth of the tale. During the Saïte age Greeks were coming to Egypt in increasing numbers as traders and mercenaries. The Pharaoh Amasis (568-525 B.C.) forbade the Greek merchants to land anywhere in the Delta except at the city of Naukratis, which he founded especially for their use and which soon became "the most important commercial centre of Egypt, if not of the whole Mediterranean." [32]

A sort of Egyptian Renaissance - lacking, however, in the youthful strength and enthusiasm of the European Renaissance - occurred during the two centuries of Ethiopian and Saïte rule (Twenty-Fifth and Twenty-Sixth Dynasties). Efforts were made to revive the glories of the past by imitating the artistic and literary styles of the Old and Middle Kingdoms and reverting to ancient costumes, ranks, titles, and the like. "The earlier stages of this renaissance were more effective, with a successful capture of form and vitality. When, however, the movement settled down to mere slavish copying, ... the work became dull and lifeless ... An enfeebled and weary old age sought its compensation in the blind and ritualistic worship of a past of strength and accomplishment." [33]

"Old, degenerate, vain, and corrupt, in spite of a fair-seeming exterior," Egypt by now "was ill-organized for defense ... against the "vigorous juvenility of Persia," [34] looking voraciously upon the riches of the Nile Valley. In 525 B.C. these riches fell to Cambyses, and thereafter for 120 years Egypt remained a rebellious province of the Persian Empire. Darius ruled severely but with considerable statesmanship. He improved the system of irrigation, introduced coined money, and re-excavated the Nile-Red Sea Canal.

A successful revolt in 404 B.C. ushered in a final span of some sixty years of independence, during which two Pharaohs named Nektanebo ruled with a "certain nobility and dignity." Then came the end. To the Persians "Egypt meant flesh-pots, corn, and gold... Accordingly, prematurely aged Persia must put forth her half palsied arm again to try to coerce decrepit Egypt into submission." [35] In 341 the ruthless, arrogant Artaxerxes Ochus drove out the last of the native Pharaohs, and according to an Egyptian chronicler stabled an ass in the temple of Ptah and had Apis, the sacred bull, roasted for a banquet. Whether or not this was a mere "atrocity tale," when the youthful Alexander marched into Egypt eleven years later and paid respect to Egypt's gods, many an Egyptian must have felt relieved.

The Character of the Ancient Egyptians

Before we turn to this event and a new age, a word must be said with regard to the character and spirit of the ancient Egyptians. When we recall the prodigious efforts expended upon the construction, furnishing, and decoration of tombs and mortuary temples and when we reflect, further, on the fact that most of what is known of ancient Egyptian life is derived from such sources, we are easily tempted to believe that the Egyptians were a morbid folk who spent their whole time thinking of death. Professor Wilson, in his absorbing volume "The Burden of Egypt," has made it abundantly clear that until as late as the Nineteenth Dynasty this was by no means the case.

The Egyptians of the great ages of the Old, Middle, and New Kingdoms were an "easy-going" people, filled with "self-confidence," "cheerful urbanity," and "joie de vivre." "The gay, active, extroverted, successful life they lived was the great reality, and they light-heartedly refused any extinction of that life."[36] "All tombs from the Fourth to the Nineteenth Dynasty put their emphasis on life and denied the validity of death ... A typical Eighteenth Dynasty tomb crowded its walls with scenes of agriculture, viticulture, fishing, fowling, hunting in the desert, the work of the artisans, banquets, foreign tribute, and rewards from the pharaoh." Toward the end of the Nineteenth Dynasty, however, "we become aware of a drastic change. Within the space of two or three generations, the tomb has discarded its devotion to this world and dedicated all of its wall space to death and the next world. The shadow of an uncertain eternity had dropped over the sunny gaiety of Egypt ... The perennial joy of Egypt was gone; the next life was now presented as a release from this life and as a reward for humble patience in this life."[37]

One of the most appealing qualities of the Egyptians of the Old and Middle Kingdoms was their whimsical sense of humor, of which Professor Wilson gives a number of examples. It was a gentle "humor of contrast or incongruity," whereas "the humor which developed in Egypt's later cosmopolitanism seems more biting and sarcastic, a humor of ridicule."[38] Ultimately it would appear that this, too, was lost. "It may be that the nation was becoming depressed by continued foreign rule and gloomier than it was in olden days. Certainly in late Roman times all joyousness seems to have departed from Egypt, when we seem to have reached an age of humorless, semi-idiotic religious delirium and fanaticism, and the dirtier, the stupider and the more delirious a man was the holier he was deemed to be."[39]

GRECO-ROMAN EGYPT, 332 B.C.-639 A.D.

In the autumn of 332 B.C. Alexander the Great, then only 24 years old, led his armies into Egypt. The Persians offered no resistance and the Egyptians welcomed the young Macedonian. Her first European conqueror, Alexander brought Egypt under Western political and cultural influence for an age that was to last nearly a thousand years - the Greco-Roman age. In terms of government this age may be divided into three almost equal periods,

those of Ptolemaic Egypt, Roman Egypt, and Byzantine Egypt.

While in Egypt, Alexander performed two acts that were to have far-reaching results. One was to found the city of Alexandria, soon to become and long to remain the chief seaport of the eastern Mediterranean world and the main center of Hellenistic civilization. The other was to make a journey far out into the western desert to consult the Oracle of Amon in the lonely oasis of Siwa. By so doing, Alexander recognized the "dignity and credibility of the Egyptian religion."[40] He also secured recognition of himself as a god, the son of Amon. Though prompted by his own romantic and mystical spirit, Alexander took this action partly for political reasons. It made him a legitimate successor of the Pharaohs in the eyes of the Egyptians and it substantiated his claim to absolute authority in those of many Greeks and Macedonians. For at least two hundred years the Oracle had been revered and consulted by Greeks from all over the Hellenic world, who identified Amon with their own Zeus. In later years the Ptolemies, other Hellenistic kings, and finally the Roman emperors followed Alexander's example in having themselves deified to provide a theological sanction for their assumption of absolute authority.

Ptolemaic Egypt, 323-30 B.C.

Alexander stayed about six months in Egypt. He then marched eastward upon the amazing campaigns that took him deep into the heart of Asia and to the plains of the Indus and that brought an immense territory under his dominion. His empire, however, was fated soon to fall apart, after his death in Babylon in 323 B.C. In that same year one of his generals, Ptolemy, son of Lagus, a Macedonian noble, was appointed satrap, or governor, of Egypt, and like several of its later governors set himself up as an independent monarch when the time was ripe (306 B.C.). Thereafter, Ptolemies held the throne of Egypt for 275 years as theologically authentic pharaohs, or god-kings. They avoided intermarriage with the native Egyptians, however. Cleopatra VI, the last great Ptolemy, is believed to have had no Egyptian blood in her veins, but to have been mainly Macedonian and Greek with a small Persian strain.

The first three Ptolemies - Ptolemy I (Soter), II (Philadelphus), III (Euergetes) - were able men. Their rule totaled 102 years (327-221 B.C.), or 38, 39, and 25 years, respectively. They gained control over an extensive empire, which embraced, though not always continuously, Phoenicia, Coele-Syria, Palestine, the Cyrenaica, Cyprus, certain islands in the Aegean, and parts of southern Asia Minor, Thrace, and the mainland of Greece. Their principal rivals, with whom they were often at war, were the rulers of different parts of Alexander's former empire, in particular the Seleucids, also of Macedonian descent, who held an empire of varying extent in southwestern Asia. Ptolemy III brought Egyptian power and prestige to its highest point during the Ptolemaic era when he invaded the Seleucid realm early in his reign, penetrating as far as Babylonia and also, according to ancient but dubious sources, to Bactria and even to the borders of India.

The early Ptolemies held their empire together by means of a strong navy and army. Their forces consisted mostly of Macedonians and Greeks, with a lesser representation of other non-Egyptians. Despite their status as Egyptian "gods," these kings were aliens who placed little confidence either in the military spirit or the loyalty of native Egyptians. One of their chief reasons for maintaining the outlying empire was to secure reliable soldiers and sailors from its several regions, something that they could not do in Egypt. There were other reasons, however, such as pride of possession, "fear of other aggressors, and the interests of trade." Phoenicia and its hinterland were necessary to Ptolemy because of their forests of timber for shipbuilding, which Egypt lacked."[41] Another probable motive for holding Palestine and Syria was to assure control over the South Arabian and Indian trade through the Red Sea and to counteract the development of the rival trade route to India by way of the Persian Gulf.

The early Ptolemies set up a system of government which endured throughout the remainder of the Ptolemaic period and many features of which were carried over into Roman times. Recently characterized as "one of the most perfect examples of a totalitarian state that the world has ever seen,"[42] it was based on the doctrine that the whole of Egypt, land and resources, was the personal property, the estate, of the king. This theory was nothing new. What was new was the efficiency with which the Ptolemies put it into force. They did so through the agency of a complex bureaucracy, devised by Greeks, elaborated during the reign of Ptolemy II, and consisting mostly of Greek personnel.

The bureaucratic officials administered the collection of rents and taxes and the operation of royal monopolies in many industries. Taxation was burdensome and oppressive. The revenues were applied for the most part to the upkeep of a magnificent court and the promotion of public works and other enterprises mainly in the interests of the ruling house and of the Greco-Macedonian element in the population.

In the last analysis the Ptolemies' authority within Egypt rested on the army and they ruled as military despots. Since the soldiers at first were not recruited from among the natives but were brought into Egypt from the outside, the kings assigned to them plots of land in different parts of the country. At the outset these reverted to the crown upon the death of the assignees, but during the reign of Ptolemy III possession of them was made semi-hereditary. Chiefly in order to widen the area of cultivable land for military colonization, the early Ptolemies carried out extensive projects of irrigation and drainage, particularly in the Faiyum and the Delta. During the reign of Ptolemy II his wife Arsinoe, who was also his full sister, took an especial interest in the reclamation of the Faiyum, where the "Arsinoite nome" became the richest and most populous district in Egypt, with a large Greek colony.

The crown not only assigned small plots of land to the soldiers but larger holdings to Greek and Macedonian friends and favorites. Furthermore, "Greek scientists and technicians were needed for the land-reclamation schemes of the Ptolemies and for their experiments in scientific

agriculture," and "Greek administrators were employed to build up the elaborate bureaucracy by which the country was administered."[43] In these ways there came into existence a considerable number of rural communities of Hellenic stock and culture. The principal Hellenic centers, however, were in three cities, the old commercial port of Naukratis, the city of Ptolemaïs founded in the reign of Ptolemy I in Upper Egypt, and the capital, Alexandria. These were Greek cities - the only ones of their kind in Egypt until Roman times, when Hadrian founded a fourth, Antinoupolis - with Hellenic municipal institutions and ways of life. Alexandria calls for further comment.

Under the Ptolemies Alexandria grew to be a great, teeming, cosmopolitan seaport, its quays and streets thronged with "people from all over the known world - Greeks ..., native Egyptians, Italians, Romans, Jews, Syrians, Persians, Indians, Negroes."[44] Before the close of the dynasty the total population may have been nearly a million. In the records of seafaring and of architecture Ptolemaic Alexandria is perhaps best remembered for its lighthouse; in those of learning and literature for its Museum and Library. The lighthouse on the island of Pharos, an immense structure built during the reigns of Ptolemies I and II, was deemed one of the wonders of the world in its time. According to a modern conjectural restoration, it resembled an ornate old-fashioned skyscraper. "The lantern was formed of eight columns surmounted by a cupola ... The flame was obtained by burning resinous wood. It is believed that convex mirrors made of metal were used to give a longer range of light."[45]

The Museum, which also dates from the time of the two first Ptolemies, was not, of course, a building where objects of different kinds were kept on exhibition. It was, rather, a "temple of the Muses," a foundation for the advancement of the arts and sciences where men of letters and savants engaged in research, writing, editing, and teaching, as "Fellows of the Museum" under royal patronage. "In literary criticism, in exact science, in geography and kindred studies, the Museum made advances in knowledge which were among the most important in the progress of human civilisation. If the produce in poetry and in philosophy was poor, we must attribute such failure to the decadence of that century, in comparison with the classical days of Ionia and of Athens."[46]

Associated with the Museum was the great Library, the largest collection of Greek books in the ancient world. The books were written on rolls of papyrus each of which was the approximate equivalent of a modern bound volume. Of these the Library is said to have contained half a million, but many "must have been replicas, because the whole number of works composed up to that time in Greek would not run to that number of volumes ... It seems likely, therefore, that the Alexandrine Library served not only as a reference library for students, but as a place where copies were prepared for the market, and were stored."[47] The head librarians were men of distinction. Best known among them was Eratosthenes of Cyrene, who served from 235 to 195 B.C., a scholar of vast and varied learning, remembered chiefly as a geographer who devised an ingenious method for measuring the circumference of the earth and applied it with surprising accuracy.

The early Ptolemies, especially Ptolemies II and III, sent expeditions to the ancient land of Punt to secure wild animals for the royal zoo and elephants for military use. In an all-day procession during the elaborate coronation ceremonies of Ptolemy II "there were 24 huge lions ... 26 snow-white Indian oxen, 8 Aethiopic oxen, 14 leopards, 16 panthers, 4 lynxes, 3 'young panthers,' a great white bear, a camelopard, and an Aethiopic rhinoceros ... There were besides 24 chariots drawn by elephants, 14 by various antelopes, 60 by goats, 8 by wild asses." [48]

The need of wild-life conservation was recognized when one of the Ptolemies, probably Ptolemy III, alarmed at the depletion of the elephant supply by native hunters, "offered the people, through his generals, large awards to preserve" [49] the animals. From the southern regions of the Red Sea and from Somaliland, the elephants were brought to the Red Sea port of Berenice on vessels especially built for the purpose. Thence they were driven across the desert to the Nile. The Ptolemies established an elephant corps in their army as a counterpoise to that of their rivals, the Seleucids, who obtained their animals from India. The African elephant, however, is not so readily trained as his Indian cousin, and the elephant corps was abandoned after Ptolemy IV's elephants ran away at the battle of Raphia (217 B.C.).

Before the age of the Ptolemies India lay almost completely outside the range of Egyptian and of Greek knowledge. Alexander brought India and the Mediterranean world into contact with one another, and trading with India by way of the Red Sea and Persian Gulf developed on a considerable scale. Probably in the interests of commerce, Ptolemy II sent an ambassador to India, and Sir Flinders Petrie believed that "already in the middle of the 3rd century Buddhist festivals were celebrated in Egypt." [50] "How far there were continuous voyages" at this time "between India and the Red Sea ports, how far the Greek-Egyptian ships confined themselves to the Red Sea and picked up the Indian merchandise in South Arabia is doubtful," as is also "the date when the sea captain Hippalus discovered the monsoon and so facilitated direct voyages." This discovery, one of the most productive in the history of navigation, may have been made before the close of the Ptolemaic times.

The fortunes of the house of Ptolemy began to decline after it had ruled for about a century. Ptolemy IV (221-203) was "a weak and contemptible debauchee, completely in the hands of his unscrupulous minister Sosibius, his vile mistress Agathoclea, her viler brother Agathocles, and their ghastly mother Oenanthe, as sordid a gang of scoundrels as ever governed an Empire until the rise of the Nazis." [51] As a result partly of his neglect of the navy and partly of the disorganization due to a native insurrection during his reign, most of the outlying territories were lost soon after his death. Abandoning the policy of his predecessors, Ptolemy IV had recruited native Egyptians into the army, and they proved their mettle at Raphia in 217 B.C., a battle which he won over the Seleucids, despite the rout of his elephants. This Egyptian victory aroused the hope "that in Egypt, too, the old people of the land might successfully stand up to the ruling Greek and Macedonian race, might do to them as their fathors had done to the Hyksos." [52] The revolt took the form of a savage guerrilla war, and was put down, only to be followed

by other outbreaks in the later years of the dynasty. It is not unlikely that the priests of the old religion, despite the attentions and favors that the kings lavished upon them, aided and encouraged the rebels.

The last 170 years of Ptolemaic rule (200-30 B.C.) were an era of growing political impotence, economic depression, and cultural decay. Mahaffy characterizes it as a time of "gradual relapse of the country from Hellenism into the ineradicable Egypt of the native race." [53] This movement was particularly marked in the rural districts, where the Greek settlers "intermarried freely with the natives," and, for the worship of the Olympian gods, substituted "a devotion to domestic cults or to Egyptian deities. In 98 and 95 B.C. we find groups of Ephebes, Greek youths, educated in accordance with Hellenic traditions, making dedications to the crocodile god of the Fayyûm." [54] The kings of this era may have been wanting in the strength and ability of the first three Ptolemies. Ptolemy VI (Philometor, 181-145) and his brother Ptolemy VII (Euergetes II or "Physkon," 145-116), who followed him, however, had long and not unsuccessful reigns. Thus they were able to extend and maintain Egyptian authority over Lower Nubia to the Second Cataract, or farther south than it reached at any other time during the Greco-Roman era. Ptolemy VI was benevolent and kindly, morally perhaps the "best" of the Ptolemies; his brother was depraved, bloodthirsty, and vicious, though not without a genuine appreciation of literature, art, and scholarship. After Ptolemy V "we have almost constantly rival brothers asserting themselves in turn, queen mothers controlling their king sons - intestine feuds and bloodshed in the royal house, till the stormy end of the dynasty with the daring Cleopatra VI." [55]

The halting, often hesitant, but irresistible advance of Roman power eastward across the Mediterranean world coincided with this decline in Egypt. Too weak to withstand the Romans, the later Ptolemies appeased them, sought Roman support against external enemies and rival members of their own family, and bought survival at the cost of dignity and independence. Roman intervention saved Egypt from conquest by the Seleucids in 168 B.C., but from then on Egypt in effect was a Roman protectorate, at first of the Senate and finally of the "all-powerful generals who had dethroned" [56] the Senate - Pompey, Caesar, Antony, Octavian - whose civil wars with one another marked alike the death throes of the Roman Republic and the birth pangs of the Empire.

Cleopatra was now queen of Egypt, and she used her charm and her brains in a courageous effort to save herself and her dynasty. "Whatever her moral failings, she was a woman of outstanding genius and a worthy opponent of Rome ..." [57] By capturing the hearts of Caesar and of Antony she postponed the reckoning, and had events worked out as she hoped and planned she would have become co-founder of Rome's first imperial dynasty. Octavian, however, was cold and heartless, and if the immortal story can be believed Cleopatra preferred death at the fangs of an asp to the fate that he had in store for her in his triumphal march in Rome.

Roman Egypt, 30 B.C.-c. 300 A.D.

Octavian became the first Roman Emperor (unless Julius Caesar be so regarded) and ruled under the surname Augustus. He made Egypt a Roman province in 30 B.C. so as to assure a steady export of grain to Italy, thus putting into effect a measure that Crassus, Caesar, and others had often discussed. The Roman people had already become dependent on the Nile valley for a substantial part of their food supply. Egyptian agriculture, however, had grievously deteriorated, and Augustus undertook to restore its productivity. He set the army to work cleaning, deepening, and extending the irrigation canals, he brought new land under cultivation, and he encouraged agricultural enterprise by adding to the number of land holdings in private hands. To preclude the chance of a rival getting control of the country, as Antony had done, Augustus placed Egypt under the special supervision of the Emperor and forbade men of senatorial rank to visit it without his permission. As a protection against invasion from the south he established a military frontier zone, the Dodecaschoenus, extending some seventy miles up the Nile into Nubia above the First Cataract.

For nearly nine centuries Egypt was to remain a province (or a group of provinces) under the administration of governors sent in from outside. Its rulers at first were Romans of the united empire, then "Romans" of the east-Roman or Byzantine Empire (most of them in reality Greeks), and after the Arab conquest the caliphs of Islam. For ten years during the early sixth century Egypt was held by the Persians. All of these masters treated Egypt as a "cow to be milked."

The Romans took over the totalitarian system of the Ptolemies and made it more efficient. For example, they "introduced a regular census taken every fourteen years," in which the owner or occupier "of every house was required to make under oath a return of his house and all its occupants, of every age and condition, to a commission appointed for the purpose."[58] From the reign of Augustus until the latter years of the second century after Christ the Egyptians were comparatively well off, perhaps as prosperous as at any other time in their history. This was the great age of imperial Rome, Egypt basked in the sunshine of the pax Romana, its merchants took in the profits of free trade with other parts of the empire, and there appears to have been a flourishing commerce with India. Fortune seekers swarmed into Egypt from all parts of the Mediterranean world, and they came to form a new middle class of small landowners, traders, manufacturers, contractors, and others. Alexandria flourished. "Fierce, fickle, turbulent, pleasure-loving, flippant in speech and ready of wit, always apt to be stirred by some popular song or ribald jest into incalculable action, divided by racial feuds, and subject to sudden accesses of political violence or religious fanaticism, the people of Alexandria were a perpetual anxiety to their Roman rulers."[59] In this great city and perhaps throughout the country the average household enjoyed "a reasonably high standard of comfort,"[60] and in many households there was "some degree of culture and refinement."

The Romans did not hold Egypt as trustees for the native Egyptians. The benefits of Roman rule, and they were substantial, were incidental, for the "milch-cow" motive prevailed. "Whereas the corn and money wrung from his subjects by a Ptolemy remained for the most part in the country itself, under the Romans much of both went to Rome as tribute, and no corresponding advantage accrued to the inhabitants ... Thus the early Principate [Empire], efficient as was its administration and just as were its intentions, may fairly be held to have sown the seed whose harvest was to be the economic collapse of the third century..."[61]

The end of the era of prosperity was marked by a violent native revolt in the reign of Marcus Aurelius (161-180 A.D.), and the third century was as dark and turbulent an era for Egypt as it was also for the Roman Empire as a whole. Papyri testify to a rapid and continuous economic decline. The canals were neglected, much cultivated land and once-prosperous villages were abandoned. Symptomatic of the weakening of the government were the inroads into Upper Egypt of barbaric tribes from Nubia, the invasion of Lower Egypt in 272 by Queen Zenobia of Palmyra, and the abandonment of the Dodecaschoenus frontier region in the reigns of Decius and Diocletian. The blackest episodes of the era were the persecutions of the Christians, which began in the reign of Severus (193-211 A.D.) and broke out with special violence under Decius (250 A.D.) and Diocletian (284-305 A.D.). They were due chiefly to the refusal of the Christians to worship the Emperors as gods.

No one knows the precise circumstances under which Christianity was introduced into Egypt. It may well have made its appearance among lowly folk in the slums of Alexandria as early as the reign of Nero (54-68 A.D.). By the middle of the third century many native Egyptians in the rural districts had become converts to the new faith, which had, as always, a profound appeal to the poor and the oppressed. During the Decian persecutions, Christian hermits sought the solitude of the desert. "There, in those appalling solitudes, where by day the fierce sun scorches the rocks and dances in dazzling light on the sand, and by night the stars send down their icy radiance from a clear sky into the vast darkness of the desert, the hermits wrestled with all the powers of evil." Not long after, the establishment of monasteries began, and, indeed the movement of Christian monasticism "in all its diversified activities"[62] thus originated in Egypt at this time. Before the end of the second century Alexandria had become a center of Christian thought, and, according to one authority, no city has more profoundly affected the development of Christianity. "The outstanding legacy of Egypt to the Church, the legacy which has coloured all later history, has been the scientific Platonizing theology which the catechetical school of Alexandria was beginning to fashion at the close of the second Christian century and which the comprehensive genius of Origen carried to a successful issue in the first half of the third century."[63]

Byzantine Egypt, c. 300-639 A.D.

No single event can be said to mark a boundary between the Roman and the Byzantine eras in Egypt. The transition was gradual. Some writers have placed the division in the reign of Diocletian (284-305 A.D.), who initiated a series of fundamental reforms in the systems of taxation and land tenure which helped to improve economic conditions for a short while. The most conspicuous difference between the two eras was religious. In Roman times Egypt was officially pagan, in Byzantine times it became officially Christian, and on this basis the reign of Constantine the Great (323-337 A.D.), the first Christian Emperor, signalized the change.

Paganism, however, lingered on in Egypt in various forms until as late as the mid-6th century. Hellenic and Oriental cults and philosophies had their devotees, and the worship of the ancient Egyptian gods was kept up. However, the non-Christians were now in the minority and themselves the victims of repression which at times flared into fanatical persecution. More significant historically were the controversies among the Christians themselves.

The greatest of these came to a head when the Council of Chalcedon in 451 A.D. condemned the teachings of Eutyches concerning the nature of Christ (monophysitism). The Council's decision became a dogma of the Orthodox Church, the established church of the Byzantine Empire. The Egyptians refused to accept it, and as a consequence the Egyptian Church split off from the Orthodox Church, although the latter continued to maintain an ecclesiastical organization of its own in Egypt which is still in existence. If a quarrel over an abstruse theological point precipitated the schism, fundamentally it was more political than doctrinal. The Egyptian (Coptic) Church championed Egyptian nationalism, the Orthodox Church upheld the interests of the imperial government, and all attempts to unite the two churches failed. "The dissensions which arose in consequence of this difference in theological tenets ... undermined the influence of the Roman Empire in Egypt and facilitated the final conquest of the country by the Arabs."[64] Theodora, the wife of the Emperor Justinian (527-565 A.D.), favored the Egyptian Church, perhaps from conviction or possibly for reasons of political expediency. Through her encouragement missionaries were sent south who converted the Ethiopians to the Coptic form of Christianity.

In spite of opposition from the government, men of noble rank during the late Byzantine period accumulated extensive tracts of land in Egypt in the form of great estates. Some of them "had their own postal services, their fleets of Nile boats, their private armies, their prisons, their banks and counting houses, their baths, their hierarchy of secretaries and accountants, stewards, tax collectors, guards, and police, [and] they founded monasteries and endowed churches."[65] In certain respects this development was comparable both to the contemporaneous breakdown of centralized government into feudalism in Europe and to the similar breakdown that had occurred in Egypt some 27 centuries earlier, toward the close of the Old Kingdom. The system that emerged in Byzantine Egypt, however, was semi-feudal only. The tenures were not military but based on money payments,

the estates did not form single units but scattered holdings, and the framework of the imperial bureaucracy remained intact.

Some historians have depicted Byzantine Egypt in somber colors indeed. A recent reappraisal, based on a comprehensive study of papyri, suggests that this may have been overdone. That the peasants were sunk deeply in the abject miseries of serfdom is unlikely, despite the growth of the large estates. The native population was certainly better off during the early Byzantine period than it had been in the third century. The improved economic status and the adoption of Christianity were stimulating factors. "The native culture, dormant and apparently moribund during the Roman period, awoke to new life."[66] "In effect, the Byzantine age marks for Egypt a vigorous growth of Coptic art and culture which, had it not been overwhelmed by the Arabic invasion, might easily have set the pattern for a vigorous Byzantine civilization of vital significance in the history of the Mediterranean world."[67]

MEDIEVAL EGYPT, 639-1798 A.D.

In the years 639-642 A.D., less than a decade after the death of Mohammed, a brilliant Arab general, Amr ibn al-Ass, added Egypt to the realm of Islam. Amr was operating under the orders of Omar I, the second Caliph, who had his eye upon the tribute in grain and money that could be extorted from the Egyptians and also wished to gain control of the Nile valley in order to forestall its use as the base for a "Roman" (Byzantine) attack upon his newly acquired domains in Syria and Palestine. Amr's campaign was made easier by treachery in high ranks among his enemies and by the ever-burning hostility of the Copts to their Byzantine overlords. The campaign, however, was no triumphal march, like that of Alexander. The "Romans" contested the Arab advance and during the decade that followed made several attempts to recover their lost province.

With the Arab conquest Egypt reverted to the predominantly Asiatic sphere of political and cultural influence for an age that was to last 1159 years - until the coming of Napoleon Bonaparte in 1798. This age lay long after the middle of the whole long span of Egypt's 52 centuries of recorded history, and hence was not "medieval" in a literally chronological sense. It corresponded to late "September," "October," "November," and early "December" of the magnified "calendar year" against which we have projected this record. It was, however, "medieval" in the cultural European sense. Three quarters of it coincided with the European Middle Ages, and during the last quarter, though "modern times" had dawned in the West, Egypt still remained in medieval twilight.

We may divide this age into three periods:

1) an opening one of 229 years (639-868 A.D.) during which Egypt was a province of the Caliphate;

2) a middle period of 649 years (868-1517 A.D.) of political independence or semi-independence:

3) a closing period of 281 years (1517-1798 A.D.) when Egypt was once again the province of another state - now of the Ottoman Empire.

Egypt under the Caliphate, 639-868 A.D.

In Arabic the word "caliph" means "successor." A Caliph was a successor of Mohammed as both the religious and the political head of Islam, and the early Caliphs exerted a political and military power that was mighty indeed. The first four - Abu Bekr, Omar, Othman, and Ali - were followed in 661 A.D. by Muawiyah, founder of the Ommayyad dynasty, who moved the capital of the Caliphate from Medina to Damascus. Under the Ommayyads an empire vaster than that of Rome, extending from Morocco and Spain across North Africa and far into the heart of Asia, was conquered for Islam. In 750 the Ommayyads were overthrown by their long-standing enemies, the Abbassids, who transferred the capital to Baghdad not long after. During the Abbassid period (750-1258 A.D.) the Caliphate disintegrated, some of the fragments coming under the rule of rival claimants to the succession who established "Caliphates" of their own. Abbassid control over Egypt was lost in 868 A.D.

For the semifeudal, semi-anarchical conditions that had prevailed in Egypt during late Byzantine times, the Ommayyad Caliphs' governors substituted a highly centralized administration. By this time the great majority of the people, possibly ninety per cent, were Christians. Their new masters at first were not intolerant and made little or no effort to obtain converts to Islam. Indeed, many Copts were employed as police, in the bureaucracy, and in other government posts. The spread of Islam and of Arab culture in the rural areas was promoted by a steady immigration of Arabs, at first mainly of soldiers, but before the end of the Ommayyad period of Bedouin herdsmen.

From the outset the government was none too good. Amr, the conqueror, was appointed the first governor but was later recalled, because, it is said, he failed to extort enough from the Egyptians "to satisfy the Caliph." For the direct collection of taxes by government officials the evil method of tax farming was substituted in the Abbassid period, when extortion and oppression went from bad to worse. During the eighth and early ninth centuries one native revolt followed another, and in the 830's the ruthless suppression of a large insurrection put an end to any Coptic nationalist aspirations that might have survived. Not only the Copts but the Arab soldiers and tribesmen in Egypt were profoundly disaffected and at times in open rebellion.

The Medieval Period of Egyptian Independence, 868-1517 A.D.

In order to uphold their crumbling authority, the Abbassids placed increasing reliance on mercenary soldiers recruited from among the more warlike peoples of their empire, particularly the Turks. The "recruiting"

was often done by the simple expedients of capture and enslavement, or by purchase of children whose parents had sold them to slave dealers. Such slavery was held to be no disgrace, no bar to the advancement of men of ability and ambition, and thus it came about that some of the non-Negro slaves (mamluks) rose to high positions as governors, viziers, and even as founders of new dynasties. Mamluks and their descendants were to play an important role in the history of Egypt for nearly a thousand years. (We shall use the form "Mameluke" for the monarchs of the period 1250-1517.)

Fatimites and Other Independent Rulers.

In 868 the Abbassids lost control over Egypt to one Ahmad ibn-Tulun, the son of a Turkish slave from Ferghana who had been presented to the Caliph al-Mamun. Ahmad was sent to Egypt as its governor, and he made himself ruler of the land. Thereafter, except for some forty years (905-945 A.D.) when Abbassid rule was temporarily restored, the lords of Egypt maintained their independence until the Turkish conquest in 1517. During these six and a half centuries the country was governed by six independent dynasties: 1) the Tulunids (868-905 A.D.) and 2) the Ikhshidids (935-969), short-lived military despotisms founded by Turks originally appointed by the Abbassids to govern Egypt; 3) the Fatimites (969-1171), of Arab origin; 4) the Ayyubids (1171-1250) and the Bahri Mamelukes (1250-1390), both of Turkish stock, and, finally, 5) the Burji Mamelukes (1390-1517), for the most part Circassians.

Though short, the periods of Tulunid and Ikhshidid rule were memorable. Ahmad ibn-Tulun, energetic, just, and intelligent, laid the foundations of a new Egyptian empire. He conquered territories extending from the Cyrenaica to the Euphrates. The first of the Ikhshidids reconquered Syria, after it had reverted to the Abbassids, and added the holy cities of Mecca and Medina to the Egyptian domains.

In the year 969 a new conqueror came into Egypt from out of the west: Jawhar al-Siqilli, originally a Greek slave born probably in Sicily, and now in command of the forces of the Fatimite Caliph Mo'izz, whose capital was at Kairawan in Tunisia. Jawhar drove out the Ikhshidids, and like Alexander before him founded a great city and performed a religious action of lasting importance: he began the building of a new capital, Cairo, for his master and he established there the mosque of Al Azher, which was to become and to remain to this day a leading center of Islamic learning. In 973 Mo'izz moved his headquarters to Egypt.

Since the Arab conquest Egypt had been ruled by Sunnites, or orthodox Moslems, and the majority of the Egyptian Moslems were of this persuasion. The Fatimites brought the country under the control of heretics of the Shiite branch of Islam. The Shiites hold that the only legitimate line of succession of the supreme authority ran from Mohammed through Fatima and her husband Ali, the fourth Caliph; and hence that the Ommayyads and Abbassids were murderous usurpers.

According to Shiite doctrine Ali was the first of a line of "Imams" - the word implies much the same as "caliph" - by some sects reckoned as twelve in number, by others as seven. The last Imam had "disappeared," but would reappear as "the Mahdi" to lead the Faithful at the end of the world, or possibly sooner. Every now and then an individual has claimed to be the Mahdi as, notably, in the Sudan in 1881. Early in the tenth century a Syrian Shiite named Obeidallah, so claiming, gained a large following in Tunisia, overthrew the Aghlabids, vassals of the Abbassids, seized their territories, and founded the Fatimite dynasty. Mo'izz, for whom Jawhar conquered Egypt, was Obeidallah's great-grandson.

Probably at no other time in history have more far-flung domains been under Egyptian suzerainty than during the early years of the Fatimites. They included Sardinia, Sicily, Malta, most of North Africa, Syria, Palestine, and western Arabia south to the Yemen. The islands and remoter outlying mainland regions, however, were under the immediate rule of vassals and the Fatimite claims to them were often disputed by other powers. Hence the Fatimite "empire," though extensive was a rather loose-jointed affair.

The epoch of Fatimite rule in Egypt may be divided into two periods each of about a century in length. During most of the first the government was personally administered by the Caliphs themselves with the aid of capable civilian officials. The golden age came at the beginning, in the reigns of Mo'izz (972-975) and Al-Aziz (975-995). Wise, benevolent, and tolerant, the latter maintained an unusually magnificent court. Decline set in during the next reign, that of the deranged and fanatical Hakim (996-1020), a sadist who sought to have himself recognized as divine. The destruction of the Church of the Holy Sepulchre in Jerusalem under his orders sent a shock of horror through the Christian world, which helped bring on the Crusades. Most of the Fatimites' outlying territories were lost one by one during the reigns of Hakim and his second successor, al-Mostansir (1036-1094): Sardinia in 1003, eastern Algeria in 1014, Tunisia in 1049, Sicily in 1060, the Hejaz and Syria in 1070, Malta in 1090.

The second period opened toward the middle of the long reign of al-Mostansir, who had come to the throne at the age of eight months. In 1074, after famine, rebellion, and inroads of Berbers from the west and of Negroes from the south had brought Egypt close to anarchy, order was restored by the Caliph's vizier, Bedr el-Jamaly, an Armenian slave. Bedr, his son, and his grandson administered the country efficiently for about sixty years, and indeed from 1074 until Saladin brought the Fatimite dynasty to an end in 1171, viziers rather than the Caliphs themselves were the effective rulers, holding a position somewhat like that of the Merovingian "mayors of the palace." The viziers served the interests of the military faction, which the Caliphs of the first Fatimite period had been able to hold in restraint. Although literature and science seem to have languished under the Fatimites, architecture and the fine arts flourished. The mystically-minded Shiites were less inhibited against the making of things of beauty than were the more puritanical Sunnites.

Saladin, great and chivalrous opponent of Richard the Lion-Hearted, was a Sunnite who had interested himself in theology in his youth. Detestation of the Shiite heresy and a desire to liberate the Egyptians from its yoke were among the impulses that brought him to Egypt. Saladin's emergence as the founder of a new dynasty, however, was the outcome of the prolonged struggle in Syria and Palestine between the Crusaders and the Turks, a struggle that had become deadlocked in the eleven-sixties. The Crusaders held the coastline and Jerusalem, while the Sultanate of Damascus (a remnant of the empire that the Seljuk Turks had established in the eleventh century) occupied the interior, and it was not until the latter obtained control of Egypt that the deadlock was broken.

This last event was the outcome of a series of complex intrigues and campaigns, during which the Christian king of Jerusalem, Amalric, seized Cairo and held it for a short while. Outmaneuvered by Shirkuh, commander in chief of an expeditionary force sent into Egypt by the Damascan Sultan, Nur-ed-Din, Amalric was forced to retire. Shirkuh was then appointed vizier of Egypt as deputy of Nur-ed-Din, and upon his death in 1169 Shirkuh was succeeded by his nephew Saladin. Two years later Saladin quietly deposed the last Fatimite Caliph by seeing to it that the name of the Abbassid Caliph was henceforth substituted for that of the Fatimite in the public prayers. This symbolized a return to Sunnite religious allegiance rather than a recognition of political authority on the part of the Abbassids. Saladin himself was now the master of Egypt, and, after the death of his sovereign, Nur-ed-Din, in 1174, had himself proclaimed Sultan of a realm that included both Egypt and Nur-ed-Din's Asiatic territories.

During the nineteen years of his reign Saladin recovered Jerusalem from the Crusaders, conquered a large area in northern Syria, and came to rule over an empire extending from Tripoli and Aswan to the frontiers of Armenia and Kurdistan. Many beautiful buildings still standing in Cairo are monuments of Saladin's brilliant and enlightened reign. He founded colleges for the teaching of orthodox theology and initiated the construction of the great Citadel of Cairo, used by the rulers of Egypt as their residence until the middle of the nineteenth century.

Saladin belonged to the Ayyubid family (so called after his father, Ayyub), and for about sixty years after his death in 1193 members of this house were in control of Egypt and of an area of varying extent in southwestern Asia. These territories were sometimes united under one Sultan, sometimes divided. Frequent family quarrels, however, weakened the dynasty and made it possible for the Crusaders to cling to footholds along the coast of Syria and Palestine longer than might otherwise have been the case and even to regain Jerusalem for a few years.

In 1218 a Crusading army under John of Brienne made bold to land in Egypt and to besiege and capture Damietta, which it held until driven out in 1221 by the Ayyubid Sultan, al-Kamil. Professor Hitti explains that "this invasion was prompted by the fresh realization by the maritime republics of Italy that the centre of Islamic power had shifted from Syria to Egypt

and that only by the conquest of the latter could their ships reach the Red Sea and participate in the opulent commerce of the Indian Ocean."[68] St. Francis of Assisi, who joined the Crusaders besieging Damietta, was taken prisoner and brought before the Sultan, "to whom he openly preached the gospel." The tolerant Kamil released his captive and returned him unharmed to the Christian lines. In 1249 another saintly Crusader, Louis IX of France, seized Damietta, only to be captured the next year by the forces of the Ayyubid Sultan Salih - but very soon thereafter the Ayyubid dynasty itself was overthrown by a body of mamluk troops which had distinguished itself conspicuously in the defeat of the French.

The Regime of the Mamelukes, 1250-1517 A.D.

We have seen that ever since the ninth century mamluks, or non-Negro slaves, had risen to high rank in Egypt. We now come to a remarkable period in Egyptian history in which a feudally organized mamluk soldiery dominated the state and furnished two successive lines of rulers who held the throne for 267 years. The mamluk system had developed as a feudal organization in the empire of the Seljuk Turks, of which, as already pointed out, the Sultanate of Damascus was a remnant. From the latter Saladin brought the organization to Egypt, "where the land and villages were parcelled out among the generals of his armies, who lived on them during the winter, and joined their overlord at the head of their retainers each year as soon as the campaigning season opened."[69]

The last Ayyubid Sultan, es-Salih (1240-1249), purchased a bodyguard of Turkish mamluks, which he established in barracks on an island in the Nile near Cairo - whence they were called the "Bahri, or Nile, Mamluks." Held together by a fanatical esprit de corps, isolated by race and instinct from the people among whom they were quartered, such troops were brutally effective instruments for despotic alien rule.

The Bahri Mamluks came under the influence of Salih's widow, Shajar ed-Durr ("Tree of Pearls"), a capable if homicidal woman, who had begun her career as a Turkish (or possibly an Armenian) slave. After Salih's death (1249) they enthroned her as Queen of Egypt, but this was so shocking to Moslem antifeminist principles that after eighty days she was constrained to abdicate in favor of her new husband, the mamluk captain, whose murder she procured seven years later. Thus began the regime of the Bahri Mamelukes, of whom twenty-four in all ruled over Egypt during a period of 132 years, although the reigns of only four lasted for more than two or three years each.

In 1382 the Bahri were superseded by the Burji Mamelukes ("Mamelukes of the Fort"), twenty-three in number - and of these only six held the throne for more than two or three years apiece. These figures suggest - and the record confirms - the conclusion that only the fittest Mamelukes survived and that weaklings who seized or were placed on the throne were quickly "liquidated" by one means or another. All of the Bahri Mamelukes were Turks, and beginning with the reign of Kala'un (1279-1290), except during six or seven years, were members of one family. Apart from two Greeks, all of the Burji Mamelukes were Circassians; with them, although the crown

occasionally passed from a father to his son, the principle of hereditary succession was carried no farther.

"Constantly quarrelling with one another, ruling the country as they pleased, ethnically a body of foreigners, numerically in no proportion to the native Egyptians,"[70] the Mamelukes achieved both glory and splendor. The Bahri brought the region of the Great Bend of the Nile under Egyptian rule for the first time since the days of the Ramessid Pharaohs, and pushed the frontier southward of the First Cataract for the first time since Diocletian's reign. By 1291 they had seized Akka, the last of the Crusaders' strongholds in Syria. Their greatest glory sprang from their victories over the dread Mongols, who had captured Baghdad and brought the Abbassid Empire to an inglorious end in 1258. By preventing a Mongol occupation of Egypt, the Bahri assured to the Nile valley "a continuity of development in culture and political institutions unlike that of any other Muslim country."[71] The splendor of the Mameluke court and the "extraordinary architectural and artistic productiveness" which it encouraged were without "parallel in Egyptian history since Ptolemaic and Pharaonic days"[72] and were made possible largely by the revenues derived from a flourishing commerce with India and southern Arabia.

The greatest of the Mamelukes was probably Beybarr (1260-1271). Intelligent, hardworking, and public-spirited, he founded and restored mosques and colleges, enlarged the irrigation canals and had new ones dug, revived the navy, reconquered most of Syria from the Crusaders, advanced the southern frontier up to the Fourth Cataract, and defeated the Mongols. Kala'un (1279-1290) won a victory over the Mongols and also encouraged commercial enterprise: "his passports to traders were in force as far as India and China."[73] En-Nasir, who reigned three times (1293-1294, 1298-1308, 1309-1340), has been thus described: "This self-possessed, iron-willed man - absolutely despotic, ruling alone - physically insignificant, small of stature, lame of a foot, and with a cataract in the eye - with his plain dress and strict morals, his keen intellect and unwearied energy, his enlightened tastes and interests, his shrewd diplomacy degenerating into fruitless deceipt, his unsleeping suspicion and cruel vengefulness, his superb court, his magnificent buildings - is one of the most remarkable characters of the Middle Ages."[74]

In the period of the Burji Mamelukes "the character of the rulers was much the same as before, but everything was on a meaner scale."[75] Seldom has any government been more corrupt, more rapacious, more indifferent to the needs of its subjects. And yet the Burji were able to conquer Cyprus (1424-1426) and to add to their territorial holdings in southeastern Asia Minor.

Three circumstances combined to bring an end to Mameluke rule and Egyptian independence: (1) the growing corruption, violence, and instability within the country; (2) the collapse of the Indian trade and drying up of the revenues that it had yielded, as a result of the Portuguese opening of the Atlantic route around the Cape after Vasco da Gama's

voyage; and (3) the rise of a new and mighty power in the Middle East, the Ottoman Turks, who had seized Constantinople in 1453. The last Mameluke, Qansawh al-Ghawri (1501-1516), did his best to save the situation in Egypt. He restored order within the country and undertook a program of public works. He even sent a fleet to India, where "it defeated the interloping senhors under the younger Almeida ... in 1508."[76] Eight years later, however, striving valiantly to block the Turkish advance into Syria, al-Chawri, at the age of 76, was killed in battle, and not long after the Turkish army was on the Nile.

Selim I, the conqueror of Egypt, was a brilliant "organizer of victory,"[77] who greatly enlarged the Ottoman Empire during his short reign (1512-1520). His fearful cruelty gave rise to the Turkish curse: "Mayst thou be a vizier to Sultan Selim!"[78] In his campaign against the mamluks he used artillery and muskets, which his chivalric and valorous but old-fashioned opponents proudly scorned. On seizing Cairo, he murdered some eight hundred mamluks, who had surrendered on the understanding that their lives would be spared, and then he ordered a massacre in which 50,000 civilians are said to have perished.

Egypt as Part of the Ottoman Empire, 1517-1798

From its conquest by Selim I until the First World War Egypt remained under the suzerainty of the Ottoman Sultans. After 1798, except at a few critical junctures, this suzerainty was an irritant and nuisance rather than a particularly influential factor in Egyptian affairs. Until that year, however, it was an important factor in the lives and outlook of the Egyptian people.

Beginning in 1517, "the whole action" in Egypt "seems to be played on a smaller stage by inferior performers."[79] There was no longer a splendid court to inspire the public imagination with venturesome undertakings and to give its blessing and patronage to the arts and sciences. "The incentives to public spirit supplied by foreign wars were now withdrawn from a merely provincial government."[80] The fresh modern tides flowing in the Western world left Egypt in a stagnant backwater of medievalism, with the majority of its people sinking ever more deeply into poverty and woe. Hence Lane Poole's comment: "No one has had the heart to write the history of Egypt during the three centuries of its subjection to the Sultans of Turkey."

Politically that history would be in the main the record of a complex and dreary succession of intrigues. Selim did not eradicate the mamluk aristocracy of the emirs - or beys, as they came to be called in the eighteenth century. Some among them "had been unfaithful to their Sultan" and "had survived the general slaughter,"[81] and to these was entrusted "the administration of Egypt, subject to the superior authority of a Pasha, appointed by the Turkish government." In the course of time the mamluk faction found that it could often disregard the Pasha and run the country internally, if not in its foreign relations, much as it pleased.

In the eighteenth century mamluks held the offices of Sheykh-el-Beled (Mayor of the City) and Emir el-Hajj (Leader of the Mecca Pilgrimage), which carried much more actual authority and prestige than did that of the Pasha. Ali Bey (c. 1728-1773), Sheykh el-Beled in the seventeen-sixties, after driving out the Pasha declared his independence, and sought to confirm it by having his own coins struck and his name mentioned in the public worship. In 1771 he sent his son-in-law with an army to conquer Syria from his Turkish overlord, but the son-in-law treacherously went over to the Turkish side. In the campaign that followed Ali Bey received, but benefited little from, the support of a Russian naval task force which Catherine the Great, then at war (1768-1774) with the Porte, had sent to the Mediterranean. Had he not been defeated through further treachery and died soon after, Ali Bey might have established a new Egyptian dynasty, as did Mohammed Ali a half-century later.

By the eve of Bonaparte's occupation, the combined effects of mamluk and Turkish misrule had brought the population of Egypt down to about 2,500,000 from a figure that may have been three or four times as great at the beginning of the sixteenth century. The fellahin, now little more than serfs on the estates of the mamluk beys, were not only wretchedly poor but were being "defrauded at every turn."[82] "The distribution of water, instead of being based upon an ordered economy, depended upon force or ruse. Village fought against village for the right to a water channel; farmers came in the night, cut the dykes and emptied their neighbours' water on to their land. Deprived of water, beaten and oppressed by their overlords, many of the fellahin deserted their land and turned to a life of brigandage and crime ..."[83] There were no roads, and wheeled vehicles were unknown. Travel was everywhere unsafe. Pirates infested the Nile and bandits lurked along the edges of the desert. Internal trade had greatly dwindled and the little that remained of Egypt's once extensive overseas commerce had fallen under the control of foreigners - French and Italians. "The only industries that remained were those necessary to supply the immediate needs of a primitive agricultural community."[84]

MODERN EGYPT, 1798-1952

The French Occupation, 1798-1801

Fresh from a victorious campaign in Italy, the youthful Napoleon Bonaparte landed in Egypt on July 1, 1798, with an army of 30,000 men and a group of 122 "savants." On July 21 he defeated the mamluks at the Pyramids, but only eleven days later Nelson destroyed the French fleet at the Battle of the Nile. Though this doomed Bonaparte's expedition, which was now marooned, the army completed the occupation of the country and the savants carried out extensive surveys and other investigations which not only helped lay the foundations of the modern science of Egyptology but also blueprinted many of the economic reforms that were put into effect in the nineteenth century. After a disastrous campaign against the Turks in Syria, Bonaparte was forced to retreat into Egypt. There he

redeemed himself by a victory in the Battle of Aboukir (July 26, 1799) before returning to France to stage the coup d'état of Brumaire, which placed him at the head of the state as First Consul and led the way toward the imperial crown. In September, 1801, however, the British and Turks forced the last of the French forces to evacuate Egypt.

Bonaparte's motives for the occupation of Egypt were many. Among them may be counted a desire to prevent the British from undertaking a similar enterprise and also the hope of winning a potentially prosperous dependency and market for France and a base for a possible attack on the British in India. He failed in these purposes, but by seeking to accomplish them he brought Egypt out of the Middle Ages and into Modern Times. He rudely demonstrated that the Western nations could no longer disregard the Nile Valley as a forgotten byway leading nowhere. He swept Egypt into the arena of European imperialistic and colonial rivalries and showed that it occupies a critically central strategic position in the Eastern Hemisphere. He opened an era of European concern with Egyptian affairs and with interference in them that can be said to have been only finally ended by the agreement of the British in 1954 to evacuate the Suez Canal Base.

The French occupation also aroused the national consciousness and national pride of the Egyptians. Although Bonaparte appealed to and sought to exploit the native Egyptians' resentment against their mamluk and Turkish oppressors, his efforts backfired in two futile uprisings in Cairo against the French themselves. The occupation, however, introduced Western ideas into Egypt, and with them Western ideals of national liberty. It thus marked the beginnings of a nationalistic movement that was to grow in strength by "fits and starts" and ultimately to win virtually complete independence for the Egyptian people. The history of nineteenth and twentieth century Egypt revolves mainly around the record of the conflicts and adjustments between this new Egyptian nationalism in its various forms and the imperialistic, commercial, and strategic interests of the European Powers.

From 1798 to 1914 Egypt was under nominal Turkish suzerainty; from 1914 to 1922 it was a British Protectorate; from 1922 until June, 1953, it was a kingdom; then it became a republic. From 1805 until 1953 the immediate, nominal, and at times also the actual rulers of Egypt were members of the dynasty of Mohammed Ali. They held the ranks successively of Governor-General, 1805-1867, Viceroy (Khedive), 1867-1914, Sultan, 1914-1922, and King, 1922-1953. In terms of effective control, however, the history of Egypt since 1805 may be more realistically divided into three main periods, those of (1) Autonomy, 1805-1882; of (2) British Rule, 1882-1922; and of (3) the Kingdom of Egypt, 1922-1952.

Autonomy, 1805-1882

After the French were driven out, a few years of anarchy and strife followed, during which British, Turks, mamluks, and Albanians contended for control. In 1805 the people of Cairo rose in revolt against the Turkish

governor, deposed him, and elected in his place an army officer who had served against the French at Aboukir and had later gained prestige as commander of a contingent of Albanian volunteers. This young officer, Mohammed Ali (1769-1849) by name (sometimes written Mehemet Ali), though born in Macedonia, was possibly himself of Albanian stock. Instead of condemning his election as an act of mutiny, the Ottoman government confirmed him in office. Six years were to pass, however, before he made his authority unquestionable by his notorious massacre of some three hundred mamluks in the citadel of Cairo, where they had been treacherously invited to attend a ceremony, and of perhaps a thousand more elsewhere throughout the country. Never again were the mamluks, as such, to be a force in Egyptian affairs. The survivors, of whom there were a few thousand, merged with Mohammed Ali's "Turkish and Albanian followers to form what came to be known as the Turco-Egyptian aristocracy."[85]

Although in rank and title Mohammed Ali and his successors were subordinate to the Ottoman Sultan, in fact they ruled Egypt until 1879 as semi-independent monarchs. Like the house of the Ptolemies, that of Mohammed Ali was of Balkan origin, and the reader may perceive other parallels between the two dynasties. Mohammed Ali himself has often been called "the founder of modern Egypt." George Young, however, felt that "in character and career" he belonged more to medieval than to modern times, that "his policy was as personal and predatory as that of Napoleon,"[86] that he was essentially "an Asiatic autocrat" though he "certainly exploited European experience."[87] An Egyptian admirer has called him "by far the highest administrative genius that the East had known since the days of the First Caliphs."[88] He was one of Egypt's most dynamic rulers of all time, and he wrought fundamental and forward-looking changes in the lives of the Egyptian people.

Two related ambitions shaped his career: to establish an Egyptian empire in northeastern Africa and southwestern Asia and to convert Egypt proper into a rich, stable, and powerful state. Though he failed to reach either goal, he advanced a goodly distance toward each before the Great Powers of Europe forced him to fall back in 1841.

Throughout most of the time between 1811 and 1840 Mohammed Ali was engaged in military operations: first in Arabia (1811-1818); then in the conquest of the Sudan (1820-1822); and finally in three wars prompted by his hope of annexing extensive areas under Turkish suzerainty: the Greek War of Liberation (1824-1828), and two campaigns against the Turks themselves in Syria and Asia Minor (1831-1833, 1839-1840). His son Ibrahim (1789-1848), a military genius, served as field commander in all but the campaigns in Arabia until 1816 and the Sudan campaign. The Arabian wars were directed against the Wahhabis, puritanical Sunnite tribesmen from the Nejd in the central part of the peninsula. Under the leadership of the family of Ibn Saud, these fanatics had conquered most of the peninsula and were interfering with the annual pilgrimage to Mecca and Medina. Mohammed Ali's sons Tusun and Ibrahim conducted successful operations against them and temporarily brought a large part of Arabia

under Egyptian military rule. In the Sudan two Egyptian armies subjugated the provinces of Kordofan and Sennar. The first was led by another son of Mohammed Ali, Ismail, who was captured and burned alive. The second army avenged Ismail by massacring a large number of people, including women and children. Young has said that, in conquering the Sudan, "Egypt, in fact, became an empire before it became a nation."[89]

Ibrahim was sent to Greece at the request of the Turks to help the latter put down the Greek revolution. His early successes in Greece and Crete were partially nullified when Britain, France, and Russia intervened and the allied fleet destroyed the Turko-Egyptian fleet at Navarino (1827), after which the British forced the Egyptians to evacuate the Morea by threatening to bombard Alexandria. Crete, however, was allowed to remain in Egyptian hands until 1841. During the first war against his Turkish sovereign, Mohammed Ali's army marched triumphantly through Syria and Asia Minor and would probably have entered Constantinople itself but for Russian intervention. The Russians, however, obliged the Porte to recognize Egyptian possession of Syria and Adana and to confirm Mohammed Ali as Governor of Egypt.

In 1838 Mohammed Ali made it known that he was planning to declare his independence; he also refused to comply with the terms of an Anglo-Turkish Treaty of Commerce concluded that year, and was suspected of seeking to extend Egyptian influence into Irak. Hence, when Syrians who had revolted against him at the Sultan's instigation appealed to the Sultan for aid, the latter was easily persuaded to strike a blow against his overweening vassal. The blow failed. Ibrahim routed the Turkish army, and the Turkish fleet deserted to the Egyptians; but the Great Powers, as before, were not prepared to look with equanimity upon the breakup of the Ottoman Empire. England, Russia, Austria, and Prussia stepped in and the Treaty of London of 1841 forced Mohammed Ali to return Crete, Syria, and Adana to the Turks. The Sultan, however, was constrained to issue firmans which gave "under international guarantee, the government of Egypt to Mohammed Ali and to the eldest male of his house,"[90] fixed the tribute to be paid annually to the Porte, and limited the Egyptian army to 18,000 men. This marked the end of Mohammed Ali's dream of complete independence and also the end of Egyptian imperialistic ventures outside of Africa. It marked the beginning of a new era, in which Egypt was to become increasingly drawn into the toils of colonial dependence upon Western Europe.

Without effective armed forces Mohammed Ali could not have won his remarkable victories. He conscripted fellahin into the services, and for the first time since the later Ptolemies the Egyptian army came to consist largely of native Egyptians. The army numbered some 19,000 men in 1823, 90,000 in 1826, and 200,000 in 1840 on the eve of its enforced reduction. The fellahin at first resisted conscription, but in the course of time good morale was developed among the native troops, and the ease with which they defeated the once-terrible Turk had a tonic influence throughout the country reminiscent of the effects of the Battle of Raphia. After the destruction of his first fleet of purchased vessels at

Navarino, Mohammed Ali had another fleet built in Egypt. "In 1832 it comprised eight battleships, fifteen frigates, and twelve thousand sailors. The Red Sea squadron, of which the timbers were carried across the isthmus on camels eight abreast, cleared those waters for the first time of corsairs."[91] The profits derived from government monopolies gave Mohammed Ali much of the wherewithal for his military establishment and its operations.

Mohammed Ali's regime was totalitarian, like that of the Ptolemies. He tried to set up what has been called "an industrialized, closed, state-controlled economy,"[92] - more briefly, "State Socialism."[93] He made himself "the sole titular landlord, the sole tax-farmer, and the sole foreign trader of Egypt."[94] He simplified and regularized the system of taxation, doing away with many abuses. He abolished the feudal land tenure system that had come in with the mamluks, and he assumed nominal ownership of all land. He partially and temporarily succeeded in bringing the agricultural and industrial production of the country under a regime of governmental monopolies, whereby the products were delivered to government warehouses, paid for at low prices set by the government, and resold at a profit. He also made a mighty effort to introduce manufacturing on a large scale. This failed chiefly because Egypt lacked coal, the requisite mechanical skills, and capitalist entrepreneurs.

Mohammed Ali's economic program was anathema to the British free traders, in whose interests the Commercial Treaty of 1838 between Turkey and Great Britain was, in part at least, concluded. Under its terms English merchants were permitted to buy freely from the natives "the products of the soil and industry"[95] anywhere in the Ottoman Empire. When the Treaty of London obligated Mohammed Ali to accept these terms in 1840, his monopolistic system was doomed. This obligation also marked the beginning of an important development, "consummated only after the British occupation," a development which meant the integration of "Egypt as an agricultural colonial unit in the international politico-economic system. Its main features were specialization in cotton; the expansion of the cultivated area by means of dams and canals; the freeing of agriculture from its feudal shackles, thus giving growers an incentive to make the fullest possible use of the land; the opening up of the country by means of railways and canals; the immigration of foreign technicians and traders; the depression and eventual disappearance of most of the domestic industries owing to foreign competition; and the accumulation of a large foreign debt."[96] Egypt is by no means the only country where such things have happened. They have happened throughout "the whole colonial and semi-colonial world ..." and in most cases have led "to a loss of independence and annexation by one or another of the European powers." In Egypt the development was further complicated by the presence of the strategic isthmus of Suez.

Like all of Egypt's progressive rulers, Mohammed Ali repaired and enlarged the existing system of irrigation. But he also introduced a wholly new system into the Delta, which has now been extended to all but a few

relatively small areas in the Nile valley. Known as "perennial irrigation" in contradistinction to the immemorial "basin irrigation" (see Chapter 5, Irrigation), this permits the watering of the fields throughout the year, instead of during the floods only, and hence makes it possible to grow two or more crops annually. While perennial irrigation has increased the tempo of production and facilitated the commercialization of farming, it has also brought damage to the land through waterlogging and the deposit of salts, and perhaps even worse injury to the people through the spread of new diseases.

Mohammed Ali was deeply interested in the promotion of agriculture. On his frequent journeys of inspection he seemed "more like a farmer visiting his estate than a ruler touring his kingdom."[97] By introducing the cultivation of cotton into Egypt about 1820 upon the recommendation of a French engineer, he was responsible for a change in the economic life of the peasants second in importance only to that wrought by the widespread introduction of perennial irrigation. During the early twenties cotton became "the outstanding product of the country and the main source of the government's revenues."[98] Twenty-nine cotton mills were established under Mohammed Ali's program of industrialization.

Mohammed Ali put down brigandage. Travel became almost as safe in Egypt as in Western Europe. He brought about striking improvements in the transportation system and encouraged the growth of commerce (as witnessed by an increase in the population of Alexandria from 15,000 in 1815 to 143,000 in 1848). Early in his reign he had the Mahmudiya Canal dug, connecting Alexandria with the Nile. Three hundred thousand fellahin were employed on this project under the age-old corvée system of forced labor. It soon became a link in the rapidly developing route of passenger travel between Europe and India. After 1834 one could go from England to Alexandria by steamer, thence to Cairo by canal boat, thence to Suez by a not-too-uncomfortable stage, and from there to Bombay by another steamer, the coal for which was brought by camels to Suez. A railway replaced the stage line in the 1850's. Mohammed Ali's educational innovations were less far reaching and successful than the material improvements which he introduced into Egypt. His "educational policy had a simple aim - the training in the shortest possible time of a body of assistants who would master European technique sufficiently well to help him run a modern army and administration."[99] Despite their "utilitarianism and haste," his efforts helped spread "a certain amount of European culture which was to act as the direct stimulus of the Egyptian intellectual renaissance." The first permanent printing press was installed in Cairo in 1821.

After having declined, probably almost continuously, since the days of the Mameluke rulers, the population of Egypt increased from about two and a half million at the beginning of Mohammed Ali's rule to about four and a half at its close - evidence of a turn for the better in the circumstances of living.

Mohammed Ali died in 1849 at the age of eighty, and was succeeded under the terms of the Turkish Sultan's firman of May 23, 1841, by the eldest

male member of his family, Abbas I, son of his second son, Tusun. Abbas died in 1854, after a short and reactionary reign in which he sought to nullify many of his grandfather's reforms and innovations, and was followed in turn by Mohammed Ali's fourth son, Sa'id (1854-1863), and Ibrahim's son Ismail (1863-1879). The Porte in 1867 advanced Ismail from the rank of Governor-General to that of Viceroy (Khedive) and in 1873 decreed that the succession thereafter should follow the rule of primogeniture.

Unlike Abbas, Sa'id and Ismail were admirers of European progress, culture, and technology. Sa'id was also sympathetic with Egyptian nationalistic aspirations. "In several public speeches he stressed the rights of the Egyptians, thus angering the Turks. He improved conditions of service in the army and promoted many Egyptians to the rank of colonel. Ismail's return to the pro-Turkish policy ... was therefore bitterly resented by all Egyptians in the army,"[100] with dire results, as we shall soon see. Though lacking in the brilliant ruthlessness of Mohammed Ali, Sa'id and Ismail strove with hardly less zeal for the modernization of their country. Their enterprises were very costly. Both of them, but especially Ismail, were extravagant and financed their programs by incurring large debts. Mohammed Ali had left Egypt with no foreign debt; Sa'id left it with a debt of £E 16, 308, 075, which grew to more than £E 98, 000, 000 during Ismail's reign and was the chief cause of his undoing. Though shrewd in many respects, Ismail lacked a financial common sense that might - or might not - have forestalled the debacle to which his grandiose policy led: loss of the throne for himself, foreign financial control, and British occupation for Egypt.

The circumstances of his downfall have made Ismail one of the most controversial figures in the history of modern Egypt. British Tories and other protagonists of the Occupation have portrayed him in dark colors, as a self-indulgent Oriental despot who let his country go to ruin in seeking personal aggrandizement. Egyptian nationalists and British liberals have praised him as an able, enlightened, and progressive ruler and have put the blame for his misfortunes upon international creditors, pictured as voracious loan sharks. He deserves credit for important judicial reforms and steps in the advancement of education. "The intellectual renaissance created by Ismail in Egypt constitutes the Khedive's first claim on the gratitude of modern Egyptians."[101] George Young describes him as "short and ungainly," lacking in dignity and deportment, with uncouthnesses which "served only to accentuate the charm of his conversation and to conceal his uncanny cleverness in personal intercourse. He had a fou succès with the beau monde of Europe, and he was no less popular with his own primitive peasantry in Egypt."[102]

Nor was the latter popularity unmerited. The balance sheet would probably show that Ismail did far more to help than to harm the people of Egypt. During his reign an immense program of public work was carried out at a cost of some £E 39, 000, 000, exclusive of expenditures for the Suez Canal: 8400 miles of canals were dug, 910 miles of railways built, 5200 miles of telegraph wire strung; 430 bridges, 15 lighthouses, and 64

sugar mills were built; harbor improvements were made at Alexandria and Suez. He brought almost to completion a movement begun under Mohammed Ali and continued under Sa'id, whereby nearly all of the arable land passed from government ownership into private hands. He constructed extensive new irrigation works. The total cultivated area was substantially enlarged and there were even greater proportional gains in the cultivation of cotton and sugar cane. This latter "expansion took place at the expense of wheat, which was becoming increasingly unprofitable owing to American and Australian competition."[103]

In the Sudan Ismail added to the area under effective Egyptian rule and made an effort to put down the slave trade. To these ends he secured the services of the great British explorer, Sir Samuel Baker, and the great British general, Charles George Gordon. During the years 1869-1873 Baker extended "Egyptian authority up the White Nile to Gondokoro," only about 400 miles from its source in Lake Victoria. Gordon, who followed (1873-1880), "penetrated Uganda and asserted a real authority over the Sudan. As Governor-General at Khartum [1877-1880] ... he slowly but surely repressed both slave raiding and slave trading."[104]

Gordon's chief of staff from 1874 to 1877 was an American officer, Charles Chaillé-Long, who, together with some fifty other veterans of the War Between the States, served in the Egyptian army at this time. As one of them was later to explain: "When the Khedive had dreams of asserting his independence (before his financial troubles) he found that he could not count upon the European officers in his service, because their governments might, and did, recall them whenever political complications arose. He knew it would not be so with Americans and our four years of war had given us great military prestige. These were the reasons of his employing so many Americans. Those who had worn the blue and the gray were about equal in number, and never, so far as I know, was there the least unpleasant feeling between us on account of our late struggle."[105] Chaillé-Long and several of the other Americans carried out responsible missions of geographical surveying and exploration. One of them, Charles Pomeroy Stone, became Ismail's chief of staff with the rank of Pasha (General) and also served as President of the Société Khediviale de Géographie (1880), the founding of which in 1877 bears witness to Ismail's broad interests.

On November 17, 1869, the Khedive formally opened the Suez Canal, an event fraught with weighty consequences for Egypt and the world (see also Chapter 11, The Suez Canal). A project for a ship-canal across the Isthmus of Suez was discussed at the time of Bonaparte's occupation of Egypt, but dropped after one of his engineers, Lepère, reported that the level of the Mediterranean was about thirty feet lower than that of the Red Sea. This error and Mohammed Ali's strong opposition kept the project under a cloud until after the mid-century, by which time correction of the error, the development of steam navigation, and the clearing of the Red Sea of corsairs served to re-awaken interest in the proposed canal. Its most ardent proponent was Ferdinand de Lesseps, who had been the French Vice-Consul at Alexandria. The British, on the other hand, were opposed to the project at that time, fearing "that under cover of the slogan of

aperire terram gentibus France was trying to obtain a monopoly of communications between Europe and Asia,"[106] and De Lesseps made no progress with Abbas, who was pro-British. From Sa'id, however, a friend and former pupil, the great French promoter obtained authority to proceed.

The concession provided that the Compagnie Universelle du Canal Maritime de Suez, which De Lesseps founded in 1858, should build the canal and own and operate it for 99 years after its opening - which, therefore, came to mean until 1968. Four hundred thousand shares of stock of par value 500 francs were issued, of which more than half were subscribed in France, with a scattering of subscriptions in other countries. Sa'id at first took 64,000 shares for the Egyptian government, but through some skulduggery was induced to increase this to 177,642 shares. In 1875, however, when Egypt's credit was becoming so shaky that further borrowing seemed precluded, Ismail sold the Egyptian shares to the British government for £3,976,580 in the famous deal by which Disraeli obtained for Britain a substantial minority interest in the company and its management.

The British attitude had changed. The canal was now a *fait accompli*, and more British ships than those of any other nation were using it. During the period 1870-1880 "76 per cent of the total tonnage was under the British flag, and France, which came next, had only 8.3 percent."[107] The British were also becoming convinced of the strategic relation of the Canal to their empire.

The deal with Disraeli gave Ismail a short financial respite, but by April, 1876, the Egyptian government was insolvent and in November of that year the Khedive was obliged to submit to a system of "Dual Control" of the finances by a British and a French representative. This regime was abolished two years later, when Ismail agreed to rule as a constitutional monarch, with an Englishman as Minister of Finance and a Frenchman as Minister of Public Works; but he repudiated the latter arrangement in 1879. The English and French thereupon brought pressure to bear upon the Sultan in Constantinople, who deposed Ismail and replaced him by his son Tewfik, and the Dual Control was restored. This marked the final eclipse of Mohammed Ali's dynasty as the predominant governing force in Egypt.

The British and the French controllers had no military contingent at their command. Consequently, when the Egyptian army revolted during the years 1880-1882, the controllers were without the power to restore order. A *fellah* colonel, Ahmed Bey Arabi, son of a village sheikh, led the revolt. "Simple and slow, but with a shrewd eye for essentials - impressive from his bigness and benevolence ...," Arabi "was a *fellah* who could overcome the temperament and tradition of his race enough to take action against authority."[108] Springing from and giving expression to a genuine nationalistic movement that had been gathering strength since the days of Mohammed Ali, Arabi's uprising "was backed by the mass of small landowners," had "social as well as political aims," and "was

partly directed against intervention but mainly against" the predominant influence of the "Turko-Egyptian" aristocracy and the unreliable Khedive, Tewfik.[109]

Had it been possible for the British and the French at this time to aid the Egyptians in achieving what seems to us today to have been legitimate national aspirations, much bitterness and trouble might have been avoided later. Misunderstanding of the nationalist purposes, however, prevailed in England and France, where the revolt was branded as a military mutiny in quest of pay increases and other purely self-seeking ends. It was feared, and of course with some justification, that the rising would lead to antiforeign riots, the destruction of property, and the repudiation of Egypt's debts, and that it might jeopardize the safety of the Suez Canal. Joint armed intervention was therefore planned, and in July, 1882, Admiral Seymour's fleet bombarded Alexandria. The French then backed out. A new Government had taken office in Paris, and it feared that a military adventure might weaken France with respect to Germany more than it feared giving the British a free hand in Egypt. The British, therefore, had to "go it alone" (perhaps not too reluctantly), and in September, 1882, General Wolsey's expeditionary force routed Arabi's army at the Battle of Tell-el-Kebir. Thus began the British Occupation.

British Rule, 1882-1922

Thenceforth the British governed Egypt for forty years. Like that of the Romans before them, their efficient rule brought many advantages to the Egyptians, but also, like that of the Romans, their first purpose was to keep others out of Egypt and to derive benefits for their own country from the Nile's rich soil. Financially, the British sought to rehabilitate Egypt, primarily in the interests of its British creditors but also so as to deprive other foreign creditors of any pretext for further intervention. Strategically, the British held Egypt as a protection both of the main "life-line" of the Empire leading to India, Australia, and the Far East, and of the route from the Mediterranean to the other British African possessions.

During these forty years Egypt was in fact an integral part of the British Empire, subject to closer British supervision than many another member of that great and rather anomalous organization. Until December, 1914, however, the British adhered to the fiction that Egypt was a semi-autonomous province of the Ottoman Empire and that they were there merely to give advice. On the basis of recommendations made by Lord Dufferin, British Commissioner to Egypt, 1882-1883, an Organic Law was promulgated on May 1, 1883, which established the framework of Egypt's government - a framework which was maintained until the First World War. While this law set up representative bodies - Provincial Councils, a Legislative Council, and a Legislative Assembly - their functions were wholly consultative (except that the Assembly's approval of new taxes was required) and the Khedive was given full legislative authority in theory. In practice the presence of British troops constrained the Khedive and his ministers to abide scrupulously by the "advice" rendered them by the British Agent and the latter's subordinates assigned to the various offices, "and the initiation of all legislation was assumed

by the British advisers."[110] Thus the British governed by "governing the governors of Egypt."[111]

As Consuls-General until 1914 and from then until 1922 as High Commissioners, the British Agents exercised powers and influence comparable to those of the Pharaohs, but without comparable pretensions. Sir Evelyn Baring (Lord Cromer after 1892) ruled from 1883 to 1907. Member of a great family of bankers, he was especially well fitted for the task of bringing order out of chaos in the financial operations of the Egyptian Government. But he accomplished far more as a means to this end. To save Egypt from bankruptcy he largely made over the economic life of the country and gave to its people a humane, honest, and efficient administration and a degree of material security and prosperity that they may never have known before. He did away with the age-old abuses of graft, the corvée (forced labor), and the kurbash (the hippopotamus-hide lash, which was the tax gatherer's and petty official's instrument of extortion and oppression). He introduced sanitary measures; he reformed the prisons; he increased the self-respect of the native Egyptian soldiers through a reorganization of the army. He is chiefly remembered for the tremendous projects of irrigation put through under his regime: the Delta Barrage (completed 1890), the Aswan Dam (1898-1902), the Asyut Barrage (completed 1902), and many lesser works. By the end of his administration perennial irrigation had almost entirely replaced the older basin system throughout Lower and Middle Egypt and was making progress in Upper Egypt, and as before these improvements led to further enlargement of the area under cultivation, to the raising of more crops on the old fields, and thus, in turn and especially after 1888, to a notable increase in the production of cotton. These increases, by bringing additional taxes into the treasury, made possible the winning of the "race against bankruptcy," and, with a rise in the price of cotton after 1899, were the most influential factors contributing to the recovery of prosperity.

Lord Cromer was, indeed, one of Britain's greatest empire builders and colonial administrators. He accomplished wonders in promoting order and economic well-being among his subjects and in exercising paternal justice in their treatment. But he also stood firmly against anything that might seem to be in opposition to British interests as, for example, the development of cotton manufacturing in Egypt, which might have competed with the mills of Lancashire. He lacked faith in the Egyptians' ability to govern themselves - except at some time in the distant future - and he neglected measures that might have educated them, or helped them to educate themselves in this direction. The material benefits and security of his rule satisfied most of the people and weakened their craving for independence. "In other words, Egyptian nationalism was put to sleep for twenty years, not so much by the knockout at Tell-el-Kabir as by the knowledge that it had very little to gain by coming up for another round."[112] Only toward the end of Cromer's regime did it begin to reawaken, and then as a movement confined largely to the rapidly growing urban middle classes and stimulated largely by the virulence of the nationalist press, which, in keeping with British traditions, Cromer

sought neither to muzzle nor to control.

Lord Cromer was followed in 1907 by Sir Eldon Gorst, who had already served for many years in the civil administration of Egypt. By this time the nationalist movement was becoming a thorny problem. Gorst tried to solve it by conciliatory measures, which aroused criticism in England but were not unappreciated by the Egyptians. His successor, Lord Kitchener, who served from 1911 until August, 1914, reverted to the "tougher," more dictatorial policies of Cromer, but apparently without losing the great popularity that he enjoyed among the people of Egypt. "For Egypt had raised him, as it raised Mehemet Ali, [Mohammed Ali] from the ranks to a world-wide reputation, and, like Mehemet Ali, he was adopted by and adapted himself to Egypt ... His ... mind had shaped itself into that baffling blend of despotic decision and diplomatic duplicity peculiar to Oriental princes."[113]

To explain the background of Kitchener's fame, and also an issue that has bedeviled Anglo-Egyptian relations for the last thirty years, we must look backward in time and southward to the Sudan. Aroused, no doubt, by the intervention of the "infidel" in Egypt and stirred to a high pitch of fanaticism by a newly proclaimed (1881) Mahdi, certain tribes of the Sudan rose in revolt soon after the deposition of the Khedive Ismail. Carrying fire and sword, they defeated an expeditionary force under the command of Hicks Pasha (1883) and threatened Khartoum. To that city the British Government sent General Gordon with instructions to effect the evacuation of the garrison there. The "dervishes" - as the rebels were called - closed around the city and took it by assault in January, 1885, killing Gordon in the attack. The British and the Egyptians then withdrew all of their troops from the Sudan and left it to the untender mercies of the dervishes.

A decade later Kitchener appeared on the scene. However "first-class" as "fighting men," no horde of "fuzzy-wuzzies" could have withstood him. After a methodical advance, which involved the building of a desert railway across the great bend of the Nile from Wadi Halfa to Abu Hamed, his expeditionary force smashed the Dervish army at Omdurman, on the outskirts of Khartoum, on September 2, 1898, and within a few months the rebellion was at an end throughout the length and breadth of the former Egyptian Sudan. But the country lay waste. The uprising and its accompanying famine is said to have reduced the original population of some eight million by more than a half.

Early in 1899 Great Britain and Egypt concluded agreements establishing a Condominium, whereby the Sudan was placed under the joint sovereignty and administration of the two states. Thus originated the "Anglo-Egyptian Sudan," that strange political unit where the British and the Egyptian flags flew side by side, where Egyptians held certain nominal powers and privileges and occupied certain offices, but also where the British exercised all decisive authority.

Kitchener conducted his Sudan campaign frankly in the interests of British imperialism. He also shattered the hopes, then blossoming in the hearts of French imperialists, of an extension of French rule across central Africa from the Atlantic to the Red Sea. A few days after the battle of Omdurman he encountered Major Marchand, in command of a small French advance party at Fashoda on the Upper Nile. In diplomatic language Kitchener told Marchand to "get out," and the latter could only obey. There was a rumbling of war talk in London and Paris, but it soon subsided.

Kitchener was on leave in England when the First World War broke out in August, 1914, and he never returned to Egypt. "He was replaced by . . . Sir Henry MacMahon, who had no knowledge of Egypt, and who was in turn succeeded (1916) by Sir R. Wingate, Governor of the Sudan and Sirdar [commander-in-chief of the Egyptian army] . Wingate's twenty years of experience of arms and affairs in Egypt were a strong tower that stood well the strain of the war."[114]

After Turkey had joined Britain's enemies in the autumn of 1914, the fiction of Turkish sovereignty over Egypt was no longer tenable. Accordingly, in December Egypt was declared a British Protectorate, the pro-Turkish Khedive, Abbas (II) Hilmi (who had been a thorn in Kitchener's flesh - and vice versa), was deposed, and his uncle, Hussein Kamil, put in his place. As befitting the nominal head of a now nominally independent state, Hussein was given the title "Sultan," although Egypt, then under martial law and military government, was about as far from independence as it ever has been.

During the war the British used Egypt as the base for three successive operations: (1) against the Turks, to repel attacks upon the Suez Canal (1914-1915); (2) the offensive against Constantinople which failed at Gallipoli (1915-1916); and (3) the campaigns in Arabia, Syria, and Palestine which culminated in General Allenby's great victories and in which the scholarly Colonel T. E. Lawrence won spectacular renown as leader of Bedouin guerillas. Egypt teemed with soldiers from the British Isles, Australia, New Zealand, India, and other parts of the Empire, and some Egyptians grew rich from an unhealthy and unequally distributed wartime prosperity.

By exasperating most of the people, the British war measures, however necessary, gained for the nationalist leaders a much larger popular backing than they had ever previously received. Politically minded middle-class Egyptians were aroused to indignation by the suspension of the Legislative Assembly, the arrests of political suspects, and the censorship and suppression of the nationalist press. The widespread replacement of Egyptians by British officials in the bureaucracy was resented. The fellahin were bitter over the commandeering of their camels, donkeys, and produce, and by the revival of the corvée as a form of labor conscription. Thus, by the time of the Armistice (November 11, 1918) the Egyptians felt many grievances, both real and imagined, and inspired by President Wilson's speeches upholding the principles of national self-determination,

were ready for an attempt to rid themselves of British rule.

Saad Zaghlul, leader of the uprising which ensued (1919-1922), was a lawyer who had served in the bureaucracy. Like his unsuccessful predecessor, he was of fellah origin, but he proved to be a more skillful politician than Arabi. The delegation (wafd) which he led to Paris to present the nationalist case at the Peace Conference in 1919 formed the nucleus of the revolutionary movement and later gave the name to Egypt's most powerful political party. Although accompanied by strikes, riots, sabotage, and assassinations, the rising never reached the devastating violence of a full civil war, and viewing it in the large one can only be struck by the forbearance and restraint of the leadership on both sides. This was due in the main to the magnanimity and statesmanship of Zaghlul and of Lord Allenby. The latter was appointed High Commissioner in March, 1919, when it had become obvious that a serious situation was developing and that only a man of large stature and high prestige in Egypt could possibly cope with it.

The revolution ended in a compromise. After prolonged discussions had reached what seemed a complete deadlock, Allenby obtained from the British Government a Declaration of Independence for Egypt, which was published on February 28, 1922.[115] It proclaimed: (1) that the British Protectorate was abolished and that Egypt was an independent, sovereign state; (2) that martial law was to be abolished as soon as the Egyptian Government had passed an Act of Indemnity applying to all inhabitants of Egypt; (3) that the following matters were "absolutely reserved to the discretion" of the British Government until "such time as it may be possible by free discussion and friendly accommodation on both sides to conclude agreements in regard thereto between [the British and the Egyptian governments] : a) the security of the communications of the British Empire in Egypt; b) the defence of Egypt against all foreign aggression, direct or indirect; c) the protection of foreign interests in Egypt and the protection of minorities; d) the Sudan. Pending the conclusion of such agreements, the status quo in all these matters [was to] remain intact."

Simultaneously with this declaration, Fouad I, who had succeeded Sultan Hussein Kamil upon the latter's death in 1917, took the more European title of "King." This change "confirmed the growing tendency to regard the dynasty more as a symbol of the new nation and less as a survival of the old Turkish regime, while it encouraged the moderate nationalists to see in the kingly dignity the crowning of Egyptian independence."

The Kingdom of Egypt, 1922-1952

The Declaration of Independence contained no specifications regarding the form of government. Lord Allenby, therefore, informed King Fouad by letter that this was a matter for him and the Egyptian people to determine. A committee was then appointed, which drew up a constitution similar to that of Belgium. Enacted in 1923, it gave Egypt the representative institutions of a constitutional monarchy, with a bicameral parliament, to which most of the members were to be elected by universal male suffrage.

As we have seen, Egypt had had a parliament during the period of British rule, but it had been almost without power. Under the new Constitution the Parliament exercised an authority commensurate with, and perhaps even greater than, that of the Crown. Thus for the first time in Egyptian history parliamentary politicians and parties became influential factors in the shaping of the laws.

Universal male suffrage marked a step, but only a short step, in the direction of democracy. Most of the people were still poor, ignorant, and illiterate fellahin, incapable of active participation in politics. So few fellahin, indeed, were elected to Parliament that the interests of this class, as such, remained essentially unrepresented. When a fellah went to the polls, he usually voted for the owner of a great estate in his district, perhaps his landlord, and the large landowners dominated the Parliament. Though split up into parties which contended with each other for office and quarrelled over policy regarding the British, the Parliament put through legislation almost consistently biased in favor of the large landed interests.

The first election under the Constitution of 1923, held in January, 1924, was an overwhelming victory for Zaghlul and his adherents, who thereupon organized themselves as the Wafd party. Thereafter Egyptian party politics underwent a complex sequence of shifts and changes, extremely difficult for anyone not on the "inside" to follow. Writing in 1943, Professor Issawi interpreted these in terms of four forces: first, the King, who believed "that a benevolent despotism was most suited to Egypt," who was "determined to govern as well as to rule," and who had "around him a party of King's Friends." "Next, the Wafd, led by Saad Zaghlul Pasha and after his death [1927] by Nahas Pasha, representing militant nationalism and the desire for independence and hence supported not only by the new Egyptian ruling classes, but also by the mass of the population. Thirdly, the 'Moderates' ... representing on the whole the richer sections of the population [and] formed by successive splits from the Wafd ... Finally, the British Residency, which often had the casting vote"[117] (figuratively, of course).

"Viewed against this background," Professor Issawi continued, "Egyptian politics shows a regular and intelligible pattern. Any free elections invariably resulted in a sweeping victory for the Wafd. A conflict with the Palace followed, ending in the resignation or dismissal of the Wafd, the dissolution of Parliament, and the suspension or modification of the Constitution. Prevented from taking violent action by the belief that British troops would support the King, the Wafd would remain in opposition until either a quarrel between the King and the Moderates ... or a change of opinion in Britain ... caused their recall to power."[118]

From the beginning of the Kingdom the Wafd and other nationalist groups resented the limitations upon full independence implied by the four points that the British Government reserved to its own "absolute discretion" in the Declaration of 1922. They deemed it an affront to Egyptian sovereignty that the British should maintain a garrison in Lower

Egypt in pursuance of the first three reservations and they were perhaps even more embittered by Britain's continued refusal to acknowledge Egypt's claim to exclusive sovereignty over the Sudan. To get the British out, bag and baggage, thus became their foremost purpose, which they pursued with varying degrees of vigor and persistence. As a consequence, Anglo-Egyptian relations were long none too happy, with temporary turns for the better only in 1936 and 1942 when the Wafd came into power, and, despite their "militant nationalism," were statesmanlike enough to recognize in the totalitarian imperialism of Mussolini and Hitler a greater danger to the liberty of Egypt than any that the British might offer.

Alarmed by Mussolini's conquest of Ethiopia, particularly since it threatened one of the main sources of Egypt's water supply, the Wafd negotiated a treaty with Britain. As signed on August 26, 1936, this embodied concessions on Britain's part which marked an even more important step toward complete Egyptian independence than those of the Declaration of 1922. The Treaty was also more gratifying to Egyptian pride since it was concluded through bilateral negotiations, whereas the Declaration handed out a modicum of independence to Egypt, "on a silver platter."

The Treaty[119] officially terminated the military occupation, established an alliance between the two nations, arranged for the exchange of Ambassadors, and promised British support for an Egyptian application for membership (later secured) in the League of Nations. It also contained an important article that led in due course to the abolition of the Capitulatory regime in Egypt.

This regime, which had originated in the sixteenth century, imposed restrictions upon their independence which the Egyptians regarded as not only obsolete and unnecessary, but as humiliating. The nationals of states which had concluded Capitulatory treaties pertaining to Egypt, enjoyed a variety of "fiscal, political, and judicial immunities, freedom from personal taxation without the consent of their Governments, inviolability of domicile, protection from arbitrary arrest, and the right to be tried only through their own courts."[120] This was a reflection on the ability of the Egyptians to protect and do justice to the foreigners in their midst. It also gave to foreign residents certain unfair advantages and opportunities for abuses of various kinds. Upon the invitation of the Egyptian Government a conference of representatives of Egypt and of twelve Capitulatory powers was held at Montreux in 1937. At its conclusion a Convention was signed which "removed the last restrictions on Egypt's legislative sovereignty"[121] and put her in train for the assumption of complete judicial sovereignty in 1949, after a transitional period of twelve years.

In spite of its gratifying provisions with regard to the Capitulations and its other concessions, the Anglo-Egyptian Treaty of 1936 placed limitations on full Egyptian independence that were in line with the restrictions which the Egyptians had found so objectionable in the Declaration of 1922. For the protection of the Suez Canal Egypt was obligated to permit the British to maintain armed forces in a specified zone in the vicinity of the Canal (although the presence of these forces, it was carefully pointed out,

was not to "constitute in any manner an occupation"). In the event of war, Egypt was called upon to render to Britain "all the facilities and assistance" in its power. In the Sudan the status quo was to be maintained.

During the Second World War Egypt did, indeed, render "facilities and assistance" to the British and their allies under the terms of the Treaty, although she postponed declaring war on Germany and Japan until February, 1945, and did so then chiefly in order to qualify for representation at the San Francisco Conference and for membership in the United Nations. Until early in 1942, moreover, the Egyptian government's collaboration with the Allies was more or less enforced by British pressure and tended to be hesitant and half-hearted. As long as an Axis victory appeared probable, there was a strong Fifth Column in Egypt and it stirred up disorder. Many Egyptians, though not pro-Axis in sympathy, were also not pro-British and feared that vigorous aid to the Allies would bring severe retaliation if the Axis powers won the war. In February, 1942, however, upon British insistence, King Farouk appointed Nahas Pasha Premier, and a sweeping Wafdist victory at the polls in March confirmed Nahas' Government. This government strove scrupulously to abide by the terms of the Treaty of 1936, restoring public order and preserving it during the critical months when Rommel was pounding at the western gate. But after the Axis threat was finally removed in 1942 anti-British feeling sprang to life once more.

After the war British and Egyptian governments tried to settle their differences through long-drawn-out negotiations, but these negotiations continued to bog down over three points: (1) the Egyptian demand for a complete evacuation of all British troops from Egyptian soil; (2) British insistence that Egypt remain obligated to participate in measures of joint defence in case of war; and (3) the Egyptian claim to full and exclusive sovereignty over the Sudan.

To the British both Egypt itself and the Sudan appeared as strongholds of the utmost potential strategic importance in a possible Third World War between the Communist and the Western Powers - strongholds over which the British could relinquish their control only at dire peril to the Western cause. The British, moreover, harbored misgivings over the Egyptian Government's ability to administer the Sudan efficiently and in the interests of the Sudanese rather than of the Egyptians themselves. Such considerations, rather than outmoded motives of old-fashioned colonialism and imperialism, lay behind British "intransigence" in dealing with the no-less "intransigent" postwar Egyptian nationalistic spirit, a spirit that waxed in self-confidence and self-assertion with the loosening of the bonds that had previously held it in check.

This new spirit showed itself in 1947, when the Egyptian Government placed before the Security Council of the United Nations a complaint against the British and claimed the right of repudiating the Treaty of 1936. It again appeared, and more dangerously, the next year, when Egypt for the first time since the days of Mohammed Ali embarked upon a military adventure of its own in Asia - a war in support of the Arab League's attempt to subdue

the new state of Israel. To the discomfiture of the Egyptian nationalists, the Security Council adjourned without reaching a decision on Egypt's claims and the Israelis won a decisive military victory. A third display of Egyptian self-assertion took place in October, 1951, and precipitated a sequence of dramatic events.

During the summer of 1951, negotiations with the British Labor Government for the revision of the Treaty of 1936 came to a complete deadlock. In October the Wafd lost patience and pushed through Parliament decrees abrogating not only the Treaty but the Conventions of 1899 which had set up the Condominium in the Sudan. Meanwhile Farouk was proclaimed "King of Egypt and the Sudan." The British were not pleased. The Conservative Government of Churchill, returned by the general election on October 25, declared that the Treaty of 1936 contained no provision for its unilateral denunciation, but that they were willing to open further negotiations for its revision. They informed the Egyptians, however, that they still regarded the Treaty and the Condominium agreements as in force and that they "intended fully to maintain their rights under those instruments."[122]

The Egyptians were even less pleased. Clashes followed between the Egyptian police and British soldiers in the Canal Zone, culminating on January 25, 1952, in the killing of more than forty Egyptians. On the next day "incendiary squads, unhindered by the police, carried out a systematic destruction of British and other Western property in Cairo (including the world-famous Shepheard's Hotel), doing millions of pounds worth of damage and killing ten British subjects."[123]

This violence was the beginning of a period of chaos in which cabinets were appointed and fell in rapid succession. On January 27, the King dismissed the Nahas cabinet, appointed a new one under the premiership of Ali Maher, a political leader who had been Minister of Education in the Zaghlul cabinet, and imposed martial law.

EGYPT SINCE FAROUK

The Coup d'État of 1952

The Maher cabinet fell on March 1 and was succeeded by two others, neither of which was effective in bringing any order out of the confusion. Then, on July 23, 1952, a group of army officers, who called themselves "The Military Movement," seized Cairo and Alexandria in a bloodless coup, forced King Farouk to abdicate in favor of his infant son, and arrested a large number of political leaders. Major-General Mohammed Bey Naguib, commander of the Cairo garrison, appeared briefly, at least, to be the leader of the group.

The new regime began with a three-man Regency, a Revolutionary Command Council, and a Cabinet headed at first by Ali Maher, but, after September 7, by Naguib himself. A campaign was begun at once against the political corruption on which the leaders of the Military Movement

blamed the state of affairs that led to their revolt. But they avowed themselves to be equally concerned with the economic welfare of the country, and to that end were soon announcing elaborate plans for industrial development and the expropriation of agricultural land from the large holdings for distribution to the impoverished small landowners and tenants (see Chapter 7, Land Ownership and Tenure, and Chapter 9, Manufacturing). As early as January, 1953, a sixteen-member Permanent Council for the Development of National Production was created, which has played an increasingly important role in the drafting and implementing of a program for the expansion of the area of cultivable land in the Nile valley and delta and the development of the manufacturing industry. Execution of a program of land expropriation and distribution was begun almost immediately, with the first step the confiscation of the holdings of the descendants of Mohammed Ali - a total of nearly 200, 000 feddans (a feddan is 1.038 acres).

Egypt Declared a Republic

In January, 1953, Naguib proclaimed the formation of a "Liberation Rally," which was to take the place of the old political parties, and announced that, for a three-year period while a new constitution was being drafted, he was to be the supreme head of the government, with a Cabinet wholly responsible to him, and the Revolutionary Command Council, then a thirteen-man group, acting as a parliament. But, on June 18, Egypt was declared a republic, with Naguib holding the offices of President and Premier and with Lieut. Col. Gamal Abdel Nasser, who turned out to have been the actual leader of the Military Movement and was soon to be revealed as really the strong man of the revolt, as Deputy Premier and Minister of Interior. (The Military Movement was actually organized by a group of young officers led by Nasser, which called itself the Free Officers' Committee. Naguib was brought in as much because it was felt that an older officer of high rank was needed to give the movement dignity and standing as because of his sympathy with it.)

Egypt and the Sudan Plebiscite

Termination of the joint administration with Great Britain of the Anglo-Egyptian Sudan and some form of union of the Sudan with Egypt had long been a major item in the Egyptian nationalistic movement, and even before the republic had been proclaimed the new regime moved decisively toward recognition of the right of the Anglo-Sudanese people to self-determination of their form of government - obviously in the hope, and probably with the expectation, that the decision would be for integration with Egypt or, failing that, some form of federation. Integration would mean to Egypt the opening for rural settlement within its own boundaries of a region at which it had long looked hopefully as the only feasible outlet for the crowded population of the farmlands of the Nile valley and delta. If that could not be achieved the closest possible relations were absolutely essential if mutually acceptable arrangements were to be worked out for the building of the High Dam above the present Aswan, which heads the plans of the present Egyptian government for economic development, or, in fact, any of the substitute plans which have been proposed for the control

of upper Nile water to Egypt's advantage (see Chapter 5, Irrigation). They are particularly vital to the building of the High Dam, since the reservoir it will impound will extend far into Sudanese territory.

On February 12, 1953, an agreement was reached with the British government which provided for a three-year period of self-government for the Sudanese people, and a plebiscite at the end of the period in which they were to decide for themselves what their government was to be. That the Egyptian government immediately signified its recognition, when, on January 1, 1956, the Sudan declared itself an independent republic, is indicative of its realization of how vital good relations between the two countries are, if Egypt is to have the fullest possible use of Nile water.

The Suez Canal Negotiations

Also in February, 1953, negotiations were again opened with Great Britain with respect to the military guard of the Suez Canal - the last remaining remnant of British authority in Egypt. They were broken off, however, on May 6, when the British refused to accede to the Egyptian demand for assurance of ultimate complete evacuation of the Canal Base as the basis for negotiation. What were designated as "informal talks" were resumed on August 6, the British having agreed to evacuation of the Canal Base, provided arrangements were made whereby the Base would be maintained by the Egyptians, the right of reactivation by the British in case of an emergency agreed to, and British technicians remain after the troop withdrawal as long as they were needed to train the Egyptian replacements. (It is to be noted that this Base has nothing to do with the operation of the Canal. The Canal is operated by a private company, the Compagnie Universelle du Canal Maritime de Suez under a ninety-nine-year concession from the Egyptian government and will revert to the government on November 17, 1968. The Base is a purely military base maintained to guard against possible wartime interference with the operation of the Canal.)

Difficulties arose over the number and status of the technicians who were to be left after evacuation and disagreement over what was to be considered an emergency. The Egyptians insisted that an emergency be defined as an attack on a member country of the Arab League only, while the British were equally insistent that Turkey and Iran be included.

When by early October no agreement had been reached the Egyptians began threatening armed attack on the British troops, and early in January, 1954, there was a series of what purported to be unauthorized attacks, but the Egyptian government made no attempt to suppress them. Negotiations were continued, however, and on December 20, 1954, the Egyptian government broadcast to the country by radio that a satisfactory agreement had finally been signed on October 19.

The agreement guaranteed to the Egyptians that the British troops would be completely withdrawn within twenty months - that is by June 18, 1954 - , set up the conditions under which the Base might be reactivated,

and provided for the present use of the installations and equipment and their ultimate disposal. The agreement was to remain in force for seven years, during which time it was provided that the base might be reoccupied by the British in case of an attack on any of the Arab League countries or Turkey. With the departure of the last of the British troops, the Egyptian army was to be in full charge of the Base and a large part of the installations was to pass into Egyptian possession. Such equipment as was to remain in British possession was to be stored under Egyptian control during the remainder of the agreement period, with a view to its possible use in case of reactivation of the Base, and one year before the end of the agreement period the two governments were to consult as to its final disposal. During the agreement period, also, British civilian technicians were to man the installations jointly with Egyptian technicians, but there were at no time to be more than one thousand of them and they were to be subject to Egyptian law in all respects.[124]

The British began their evacuation almost immediately, and on June 13, 1956, the last of their troops, a force of eleven officers and eighty men, sailed from Port Sa'id.

The Decline of Naguib

In all these negotiations it was Nasser who played the leading role with Naguib rapidly losing his influence with the Revolutionary Command Council. On February 25, 1954, Naguib suddenly resigned and Nasser assumed full power as Chairman of the Council. The Presidency was announced to be vacant and was to remain so until such time as parliamentary government was restored. Naguib still had a large body of supporters, however, and in response to their demands, he was restored to the Presidency on February 27, but on condition that he relinquish all claim to the right to veto decisions and appointments of the Council and that Nasser was to be Premier. It was to Naguib's exercise of the veto that his downfall is attributed, as well as his favoring an early return to parliamentary government, for which Nasser and the Council maintained that the people were far from ready.

Naguib was not long to be satisfied with any such compromise. He was soon demanding that the Council publicly acknowledge that his reinstatement was in response to the will of the people, that the army take an oath of allegiance to him, and that all his original powers be restored. On March 9 he was restored to his position as both President and Premier, at least as far as public announcement and outward appearance were concerned.

Naguib's restoration to even a semblance of his original power was of brief duration. On March 27, while he was in Alexandria with King Ibn Saud of Sa'udi Arabia who was paying an official visit, demonstrations of workers broke out in Cairo and the trade unions controlled by the Liberation Rally called a general strike. The declared purpose was to force assurance that there would be no return of party government until the evacuation of the British troops from the Suez Canal Base

was completed.

Nasser Takes Command

Whoever engineered this disorder, it was taken by the Revolutionary Command Council as an opportunity to declare a state of siege. The strict censorship, which had been imposed in the early days of the new order and subsequently somewhat relaxed, was restored. Many of the leaders of the old political parties, who had gradually been released from imprisonment as the government gained in confidence, were again put under arrest. Naguib was once more deposed and Nasser again assumed control, but as Premier only, with a Cabinet composed of eight army officers who now constituted the Revolutionary Command Council and ten civilians chosen as experts in such areas as agriculture, industry, finance, and education. The Presidency was again declared vacant until such time as a new constitution was accepted and put into effect, although Nasser began to be frequently referred to as President in various booklets and pamphlets issued by the Information Department of his government and other agencies. Actually the government was Nasser and the military members of his Cabinet, all of whom were hand picked by him. The position of the civilian members, although they were also carefully selected, was as advisors only. Key positions in all branches of the government were held by members of the Free Officers Corps, which now consisted of 350 picked men.[125]

The Moslem Brotherhood

Nasser's government was, however, to be by no means free of disturbance. The Moslem Brotherhood, with its own idea of what the objectives of revolution should be and its terroristic methods, had still to be dealt with.

Founded in 1928, the Moslem Brotherhood was dedicated to economic and social reform, the end of all foreign exploitation and influence, the ousting of the ruling dynasty, and the restoration of the Caliphate and the return to strict conformance to the teachings of Islam as the answer to all human problems. By World War II it had achieved a considerable measure of political power and had recruited a large membership in other Arab countries as well as in Egypt. During the war it had little opportunity for political activity, but its leaders took the occasion to preach its doctrines and extend its membership throughout the country.

After the war membership in the Moslem Brotherhood increased rapidly, mainly among the working classes, but with also many students and small business men in its ranks; at one time it was estimated at between 1,000,000 and 2,000,000. It was responsible for numerous strikes and demonstrations and by the end of 1948 was so well organized and so well equipped with arms that it was ready for its own seizure of the government. Its plans were discovered, however, in time for the government to halt the uprising. Large quantities of weapons and ammunition were seized, some of the leaders arrested, and the Brotherhood officially outlawed, but only after both the Premier and Hassan al-Banna, founder of the Brotherhood and still its leader,

had been killed.

But to be officially outlawed did not mean that the Brotherhood was dissolved. It continued fomenting disorder, and although it was again suppressed in January, 1954, it is credited with having played some part, at least, in the restoration of Naguib after his brief eclipse in February of that year. Later in the year, as the result of further agitation, a large number of its leaders were arrested and some two thousand of its headquarters throughout the country closed. Finally, after an attempt in October, 1954, to assassinate Nasser, which was considered to have been engineered by the Brotherhood, seven of its members, including the Secretary-General, were hanged and Hassan al-Banna's successor was sentenced to hard labor for life. Since then little has been heard of it, but with its popular appeal, its fanaticism, and its membership in other Arab countries, it is scarcely to be considered that its day in Egypt is done.

The New Constitution

On January 16, 1956, Nasser presented a new constitution to a great public rally in Cairo and announced that its approval by a secret ballot plebiscite scheduled for June 23 would end the three-year transition period of military rule.[126] This new constitution sets forth that Egypt is to be an Islamic, Arab country under a "republican and democratic" form of government which will be committed to the development of a "welfare society." It provides for a single chamber National Assembly. The members of at least the first Assembly are to be nominated by the Liberation Rally, now renamed the National Union, but the date of their election and how they are to be elected was not announced. The drafting of election laws was reported in process but not completed when the constitution was declared ready for plebiscitory action. There is, in this connection, a statement in the new constitution that "the state insures for the female citizens means for reconciling their family duties with their public responsibilities," which was taken as indicating a possibility that women would be given the right to vote, although there was no official confirmation of this.

The possibility that the restoration of party politics at some future date is envisaged is indicated by a statement that the present suspension of political parties is to be continued until a law regulating their formation and operations has been passed by the National Assembly. But it is the obvious intention that the National Assembly will be what amounts to a one-party body for some time to come.

The government will be headed by a President whose term of office is to be six years, whereas that of the members of the Assembly will be five years. It was announced that public approval of a proposal that Nasser be chosen as the first President would be sought in a plebiscite to be held July 7. Thereafter the President is to be nominated by the National Assembly. How he is to be elected also awaits the drafting of new election laws. He is to be commander in chief of the armed forces,

and will be impowered to declare war and sign treaties subject to Assembly approval. He will have veto power over acts of the Assembly but the Assembly will be able to override his veto by a two-thirds majority vote. He is to have, also, the unusual power of bringing to public referendum "any major issues bearing on the country's higher interests," the intent being, as stated in an analysis issued by the government's Information Department, to "increase the participation of the people in the Government in a practical, direct, and continued way, avoiding in the meantime the serious drawbacks generally attached to Parliamentary systems."

The true intentions of the drafters of this new constitution are perhaps best revealed by the statement in it that laws and mechanisms put into effect by the Revolutionary Command Council before it was drafted "cannot be annulled or their validity questioned."

The new election law was announced in May, 1956. It made voting compulsory for all men twenty-one and over and optional for women of that age. In the plebiscite and presidential election held on June 23, the new constitution was accepted and Nasser was elected President by votes that were only slightly short of unanimous.

The Nile High Dam Negotiations

Early in 1956, the United States government offered to lend Egypt $56, 000, 000 to assist in constructing a high dam on the Nile a short distance above the existing Aswan Dam - the major item in the plans of the present government for agricultural and industrial development.

Egypt's primary goal is to store enough water not only for year-round irrigation of the land now under cultivation in the Nile valley and delta, but to permit the reclamation of marginal land at present uncultivable only because of lack of water, estimated by the more enthusiastic supporters of the dam proposal as upwards of 2, 000, 000 feddans (a feddan is 1. 038 acres.). (See Chapter 5, Irrigation.)

Great Britain followed with an offer of $14, 000, 000 and the International Bank for Reconstruction and Development also tentatively agreed to a loan of $200, 000, 000. In July of that year Nasser announced that these offers would be accepted.

However, before Egypt could commence construction of the proposed dam, it was necessary to reach an agreement with the Sudan Republic, since the reservoir the dam would impound would extend some ninety miles beyond the Egypt-Sudan boundary when full and flood several hundred square miles of Sudanese territory. In addition to compensation for the land that would be flooded, it was not to be expected that the Sudanese would consent to the project unless they were also to derive considerable benefit from it, since irrigation is no less required for agricultural development in Sudan than it is in Egypt and the rivers from which the reservoir will get its water all empty into the main Nile south of the international boundary.

Because Egypt was unable to come to an agreement with the Sudan, and because - after committing a large part of her cotton profits to purchase arms from the Soviet bloc - Egypt showed little prospect of being able to carry any substantial share of its financing of the dam in the foreseeable future, the United States government withdrew its loan offer in July 19, 1956, only a few days after Nasser announced that he would accept it. Great Britain and the International Bank immediately followed suit.

Nationalization of the Suez Canal Company

On July 26, President Nasser suddenly announced that the Suez Canal Company was to be nationalized, that the canal would be operated henceforth by a special agency of the Ministry of Commerce of the Egyptian government, that the profits from the canal - about $100, 000, 000 a year - would be used to finance the construction of the new dam, and that the stockholders in the Canal Company would be paid for their shares out of canal revenues at their value on the Cairo stock market on the day when nationalization was effected.[127]

On the following day, Nasser took possession of the Canal Company and declared martial law in the Canal Zone. On September 14 he took over full operation of the Canal Zone. By that time some 50 foreign pilots and about 400 other foreign employees of the Canal Company had left their posts. Orders were issued that ships must pay their tolls to the Egyptian government or be barred from the canal.

Not only did Nasser's seizure of the canal violate the Constantinople Convention of 1888 (see Chapter II, The Suez Canal) to which all the major powers of Europe were signatories, but the users of the canal were apprehensive of the ability of the Egyptians to continue its maintenance and safe and efficient operation and doubtful as to whether they could be depended upon to carry out the stipulations of the Constantinople Convention that "the Canal shall be free and open, in time of war as in time of peace, to every vessel of commerce or of war, without distinction of flag." Consequently, Great Britain, Franco, and the United States called a conference in London of representatives of twenty-four nations whose ships were the principal users of the canal. Eighteen of these finally formed a Suez Canal Users Association the purpose of which was to assure safe operation of the canal and to collect and hold the canal tolls until such time as the rights of Egypt had been determined by international agreement. However the Association could hardly carry out its program without Nasser's cooperation. This he flatly refused to give.

Complaints from Great Britain and France, counter-complaints from Egypt, and charges by Israel that passage through the Canal was being refused both to Israeli ships and to ships of other flags carrying goods to or from Israeli ports led to a discussion of the whole Suez question in the Security Council of the United Nations. On October 13 the Council approved a set of principles for operating the Canal, but took no other action.

The Israeli Invasion of Sinai and Anglo-French Occupation

On October 29 the Israeli army and air force began a drive into Sinai, with the stated purpose of destroying the bases from which it was claimed that the Egyptians had been carrying on commando raids into Israel. The first day the Israelis drove opposing Egyptian troops back to within twenty-five miles of the Canal. On the following day Great Britain and France issued a joint ultimatum calling on both Israel and Egypt to cease fire and withdraw to ten miles from either side of the canal. They warned the Egyptian Government that unless the ultimatum were obeyed within twelve hours they would send a military force into the Canal Zone. Israel accepted the ultimatum but Nasser refused to do so, and on October 31, British and French troops occupied Port Sa'id. Meanwhile Nasser had blocked the Canal by sinking tugs and a dredge in it.

The United Nations on November 5 appealed to all the participants to cease fire and voted to establish an international police force (to be known as the United Nations Emergency Force) to supervise the withdrawal of the Israeli, British, and French forces. The appeal was agreed to on the following day and November 7 saw the end of hostilities. The first of the Emergency Force arrived on November 15 and the last of the British and French troops left Port Said on December 22. Israel withdrew her troops to the Gaza Strip and evacuated that in March, 1957, when the Emergency Force moved in to take control and patrol the Gaza-Israel boundary. The Gaza Strip has since been reoccupied by Egypt.

Meanwhile the United Nations had voted to undertake and finance the clearing of the Canal, but it was not until March that Nasser finally consented. Early in April the last of the sunken vessels was raised, Nasser declared the Canal open, and a convoy of small ships carrying Russian, Italian, Greek and West German flags made the first passage of the Canal. Operation under Egyptian technical management has since been efficient and without accident or incident (though Israeli ships and cargoes are still refused passage through the canal). In April, 1958, the Suez Canal Company agreed to accept from Egypt £28,300,000 ($81,000,000) as full compensation for the property of its shareholders in that country. For the first time in modern history, Egypt has complete and effective possession of all Egyptian territory.

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2. LANDSCAPES AND REGIONS

Four major physiographic divisions are recognized in Egypt - the Eastern Desert, the Western Desert, Sinai, and the Nile Valley and Delta. In human terms, these reduce to two: the deserts (including Sinai) are large and empty; the Nile lands are small and crowded. The Valley and the Delta together comprise only three per cent of the total land area of Egypt, but within their 12,355 square miles (32,000 sq. km.) - about the size of Maryland and Delaware combined - live about 95 per cent of Egypt's 22 million people.

None of these broad divisions are completely uniform or homogeneous; each contains subregions with differing geological histories, climates, soils, land use patterns, or other cultural features. For example, the Red Sea mountains must be sharply distinguished from the rest of the Eastern Desert; Sinai's southern mountains, central plateau, and Mediterranean coastal plain are all different from each other and from the Suez Canal Zone along the western border of Sinai.

Most significant are the differences between the Nile Valley and the Delta. Notwithstanding their common dependence on the river and their generally similar crop patterns and methods of cultivation, these two regions have unlike physiographies, irrigation and drainage problems, and culture histories. Hence they will be considered separately in this chapter.

THE NILE VALLEY

For most of its 750-mile length from the Egypt-Sudan boundary to the head of the delta, about 10 miles north of Cairo, the shining snake of the half-mile wide Nile coils itself back and forth in a valley ten to twenty times its own breadth, though as wide as fourteen miles in some spots and as narrow as two hundred yards south of Aswan. The river tends to hug the eastern edge of the valley floor, but it loops and meanders back and forth and narrow bands of cultivation are almost continuous on both sides. The level-floored groove of the Nile is enclosed by scarps rising as much as 1500 feet above the river, higher toward the Sudan, lower towards Cairo; eastward and westward from the valley stretch great uninhabited plateaus.

To an airborne traveler, no contrast could be more vivid than that between the lifeless deserts and the green and fertile ribbon they enclose; "nowhere in the world is the contrast between the desert and the sown more dramatic, or the transition from solitary waste to teeming valley so sharp." Within the valley every available square inch is irrigated and cultivated; the villages and other habitations (mostly fashioned of grey Nile mud) huddle along the useless desert fringe or perch on bits of high ground afforded by the natural levees beside the river. Along the shore and in the villages stand useful date and doun palms and a few isolated eucalyptus, sycamores, flamboyants, whispering tamarisks, acacias, broad-spreading mulberries, and a wide variety of fruit trees, which

give color to the landscape and a modicum of protection from the rays of the sun, bearing down through a cloudless sky. The river itself is alive with traffic of every variety: small sailboats ferrying people from shore to shore or from village to village, larger craft and tugs and barges moving slowly upstream (with the wind) or floating their cargoes down to Cairo.

Physiographically the valley is divided into five sections, each characterized by certain distinctive features with respect to its borders, its width, and the nature and extent of its flood plain. From south to north these are: the Nubian valley south of Aswan, the Aswan-Isna section, the Isna-Nag' Hammadi section, the Nile ravine between Nag' Hammadi and Asyut, and the Asyut-Cairo section.

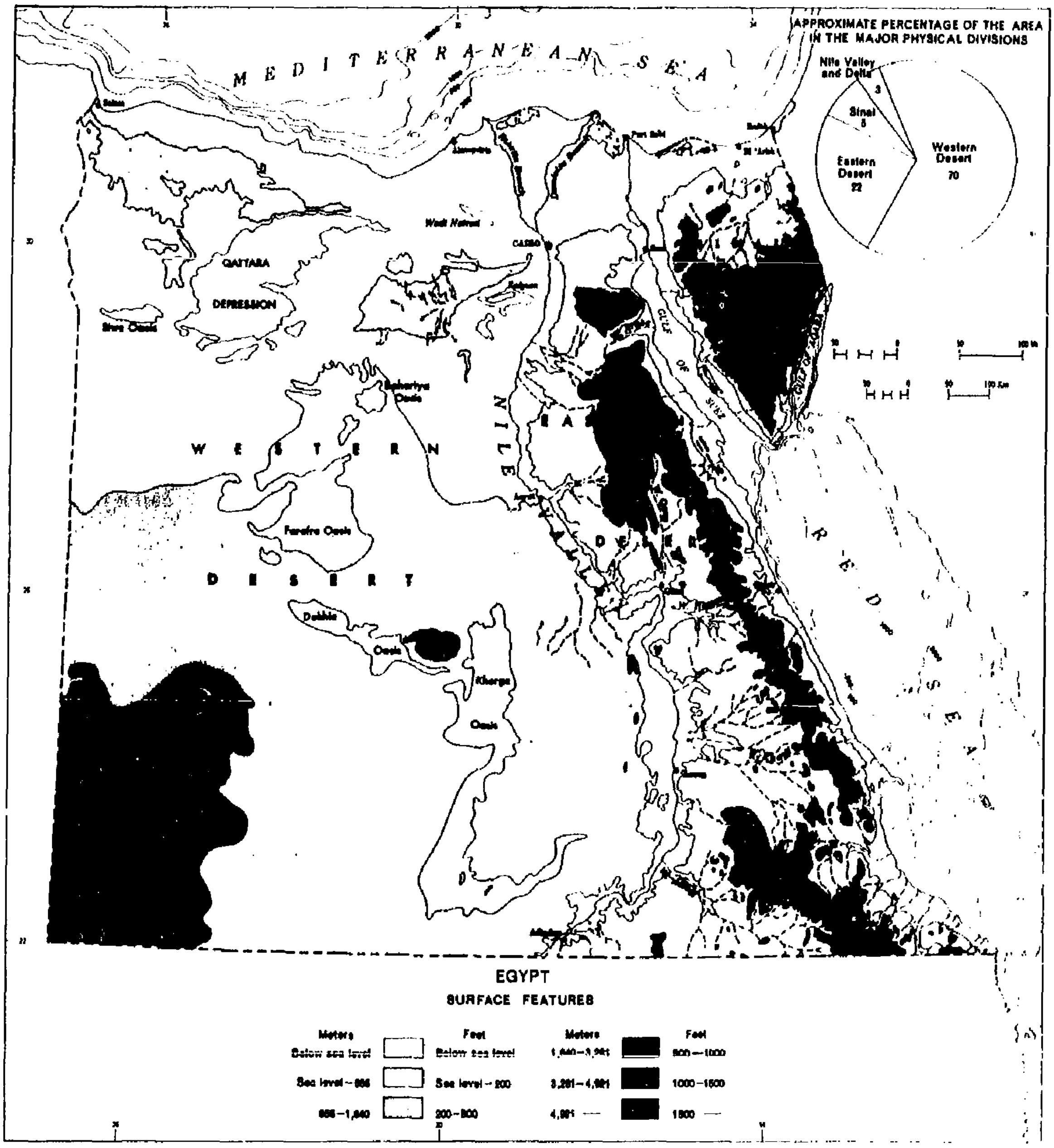
The Nubian Valley

From the Egypt-Sudan boundary to the town of Aswan, a distance of nearly 195 miles (314 km.), the Nile flows in a gorge cut into, and in places through, the Nubian sandstone plateau (see Appendix I, Geology). The river is narrow here, and there is little or no flood plain between it and the scarps of the bordering cliffs. Granite and other ancient rocks appear in two places in its course. At Kalabsha, 35 miles south of Aswan, during its high-water period it is a rushing torrent in a gorge of precipitous rocky cliffs, and for 21 miles upstream from Aswan its bed is cut in igneous and metamorphic rocks. Outcroppings of these form a six-mile stretch of rocky islands, beginning just south of Aswan, through which the river flows in a series of rapids called the First Cataract. It is on this rock, five miles south of Aswan, that the Aswan Dam was built.

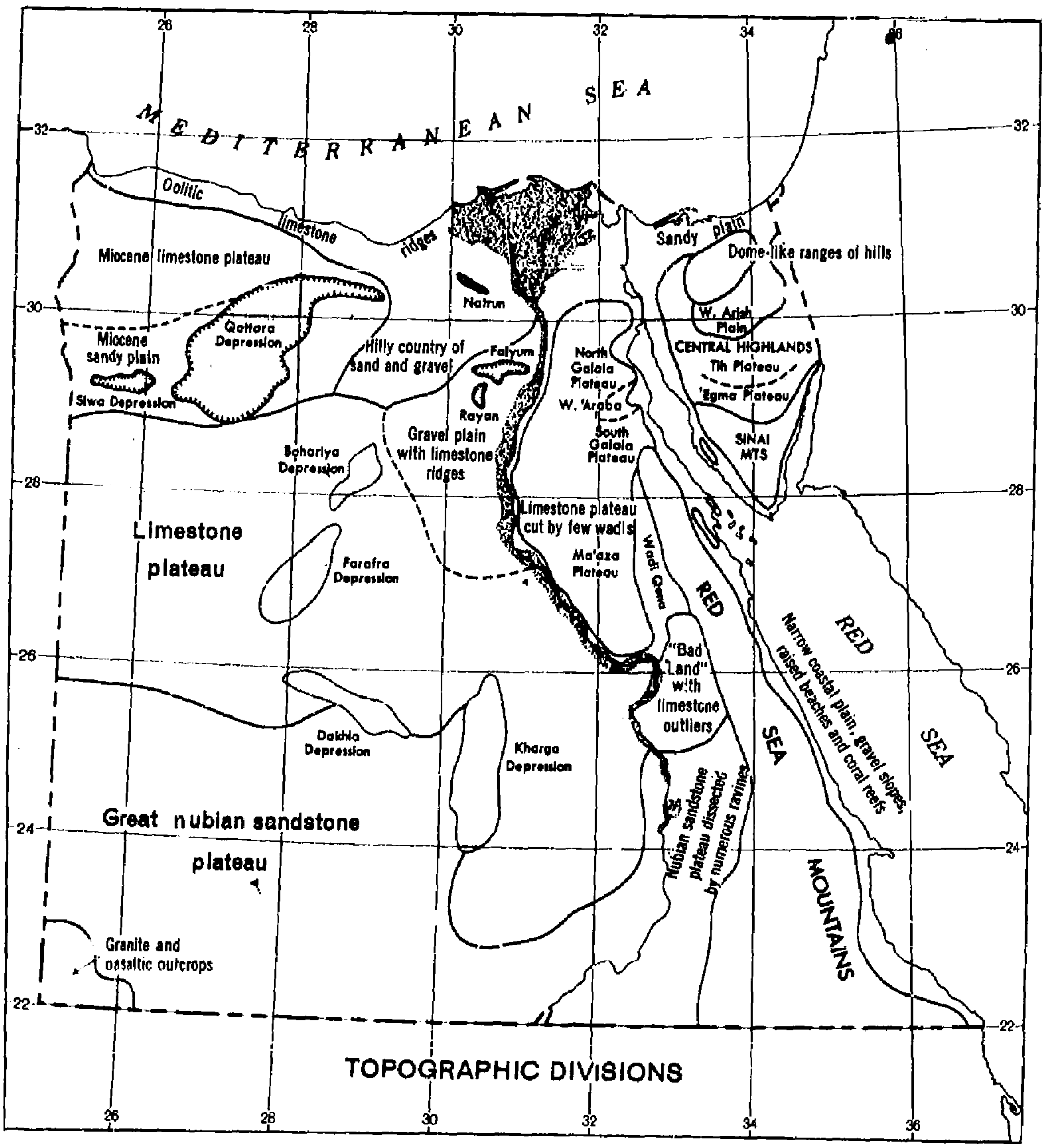
There has never been more than a very small population in this section of the valley. While the river was in its natural state there was little arable land anywhere along it, and the small, scattered patches of cultivation in the stretch of nearly 100 miles now flooded by the Aswan Reservoir had to be abandoned before its first filling. The few families that have remained in the vicinity have reestablished themselves above the reservoir's edge and irrigate their crops by lifting water from it. Along the river south of the reservoir clusters of date palms several miles apart mark a few bleak settlements, most of them near wadi mouths, where there are small tracts of alluvium.

This section of the valley has neither railroad nor motorable roads. There is regular steamer connection for passengers and cargo between the terminus of the valley railroad at the village of Shallal (Arabic for cataract), on the east bank of the river opposite the south end of the First Cataract, and the terminus of the Sudan railroad at the border town of Wadi Halfa. The valley people, however, principally use sailing craft.

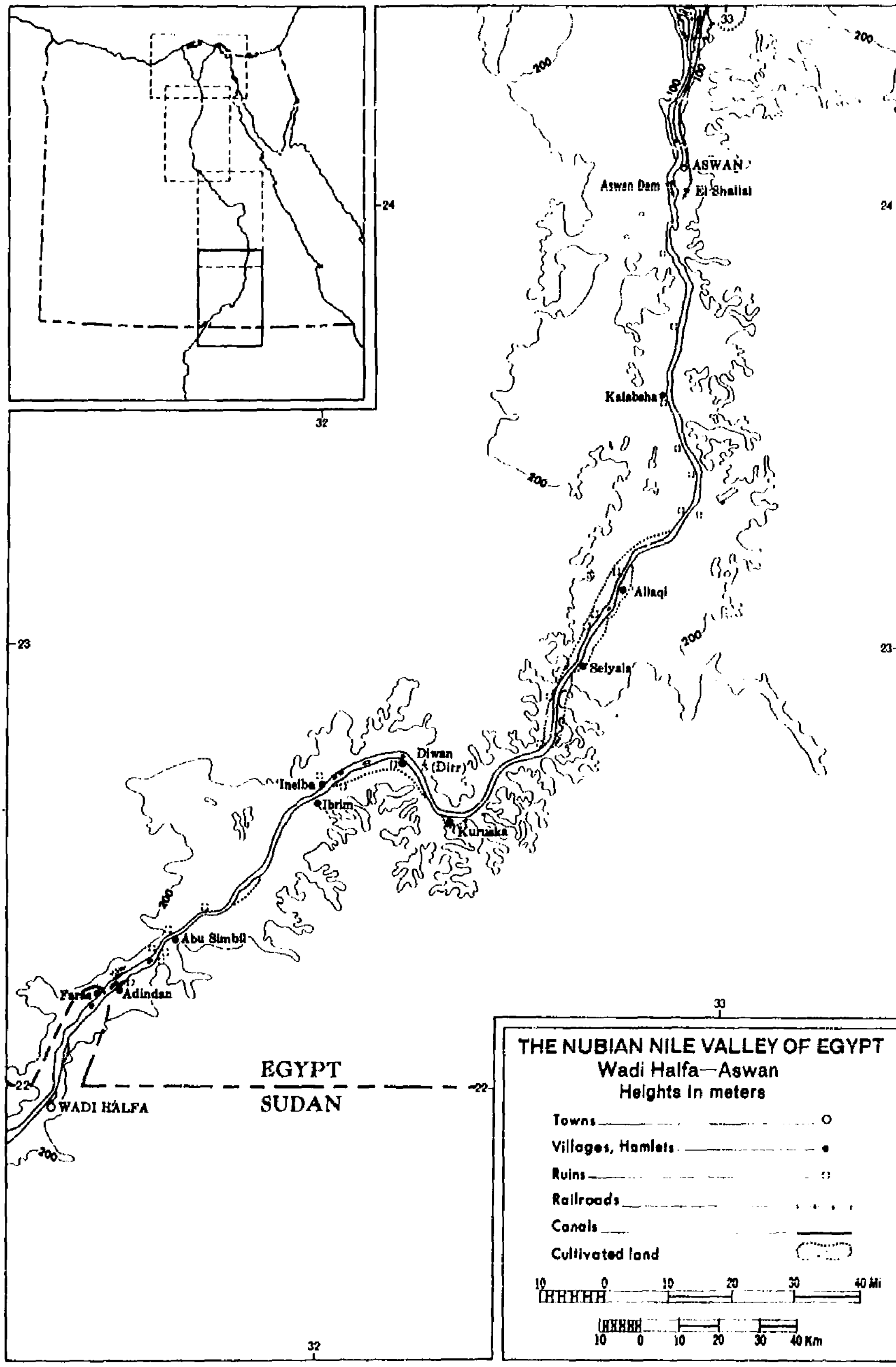
The town of Aswan (population 26,343 in 1947) capital of Egypt's southernmost province of the same name, marks the transition from the barren Nubian country to the green of the cultivated valley, although the green appears there mostly on some of the islands near the town and in narrow ribbons along the river. Since predynastic times a settlement on



EGYPT
SURFACE FEATURES



TOPOGRAPHIC DIVISIONS


THE NUBIAN NILE VALLEY OF EGYPT
Wadi Halfa—Aswan
Heights in meters
Towns
Villages, Hamlets
Ruins
Railroads
Canals
Cultivated land
10 0 10 20 30 40 Mi
10 0 10 20 30 40 Km
ASWAN
Aswan Dam
El Shallal
Kalabsha
Allaqi
Seiyala
Diwan
(Dirr)
Ineiba
Ibrim
Kuruska
Abu Simbil
Faras
Adindan
WADI HALFA
EGYPT
SUDAN
200
100
24
23
22
32
33

the present site of Aswan has marked the gateway to Egypt from the south, and for thousands of years this site was the chief southern outpost of the Pharaohs and their successors. On Elephantine (Aswan) Island, in front of the town, is to be seen the nilometer by which the Pharaohs noted the arrival of the annual Nile flood and observed its height from year to year. On measurements made here the Irrigation Service still bases its estimates of the acreage of summer crops that can be irrigated each year. [1]

On the islands of Elephantine and Philae (Anas el Wogud), opposite Shallal, are the remains of fortifications and some of the most beautiful of Egypt's ancient temples. The nearby granite quarries on the east side of the valley provided the stone for these, for certain of the pyramids and also for such well-known monuments as "Cleopatra's Needle", now on the Thames Embankment, and the Obelisk now in New York's Central Park.

Gleaming rocky islets, islands lush green with crops, the colorful granites of the east bank of the Nile, and the bright sandstone and sand of the west bank give Aswan a setting unsurpassed for beauty anywhere else in the valley. This setting and its superior winter climate make it a favorite resort for both Egyptians and foreign residents, for whom accommodations are provided in a number of fine modern hotels.

The Valley between Aswan and Isna

From Aswan to the sea the gradient of the Nile averages only 1:13,000 (1 meter to 13 kilometers), as compared to 1:11,000 in the narrow Nubian valley. A short distance downstream from Aswan the crystalline rocks that border the valley and outcrop inthe river in northern Nubia disappear again beneath the Nubian sandstone. The sandstone here also includes soft beds of clay, and the bordering plateau scarps recede, leaving space for the formation of alluvial beds which gradually develop northward into a continuous flood plain.

The first alluvial plain of any considerable size is that of Kom Ombo, on the east bank about 25 miles north of Aswan. There, two trunk wadis, Kharit and Sha'it, debouch from the east and the valley widens eastward to a maximum of 10 miles, with the river flowing along its western edge. On the black fertile soil are the sugar cane plantations of the Wadi Kom Ombo Company, a highly organized enterprise with some 38,000 feddans in cane. (See section on sugar cane in Chapter 4, Agriculture.)

The sandstone ridge of Gebel Silsila, a strong fault scarp across the north edge of Kom Ombo, accounts for the existence of free plain. During the forming of the Nile valley this rock barrier held back the water discharged by the Kharit and Sha'it wadis from the Red Sea Mountains and later by the Nile itself from its upper sources. The main drainage of the basin then was through a broad channel east of Gebel Silsila. This channel was eventually choked with alluvial debris and is now an abandoned valley through which the railroad has been routed. The present channel of the Nile cuts through a five-mile stretch of gorges at the west end of Gebel Silsila. This is an almost barren section of the valley; only in narrow

fringes of green toward the west-bank town of Idfu, 65 miles (104 km.) north of Aswan, does the flood plain begin again.[2]

The location of Idfu (population 26,192 in 1947) is of special interest because at this point the flood plain of the Nile begins to widen. From here on, the arable, irrigated land extends continuously all the way to the delta, bordering the river on both sides, but generally much wider on the west side than on the east. Since ancient times important caravan tracks have connected both the Eastern and Western deserts with the valley at Idfu.

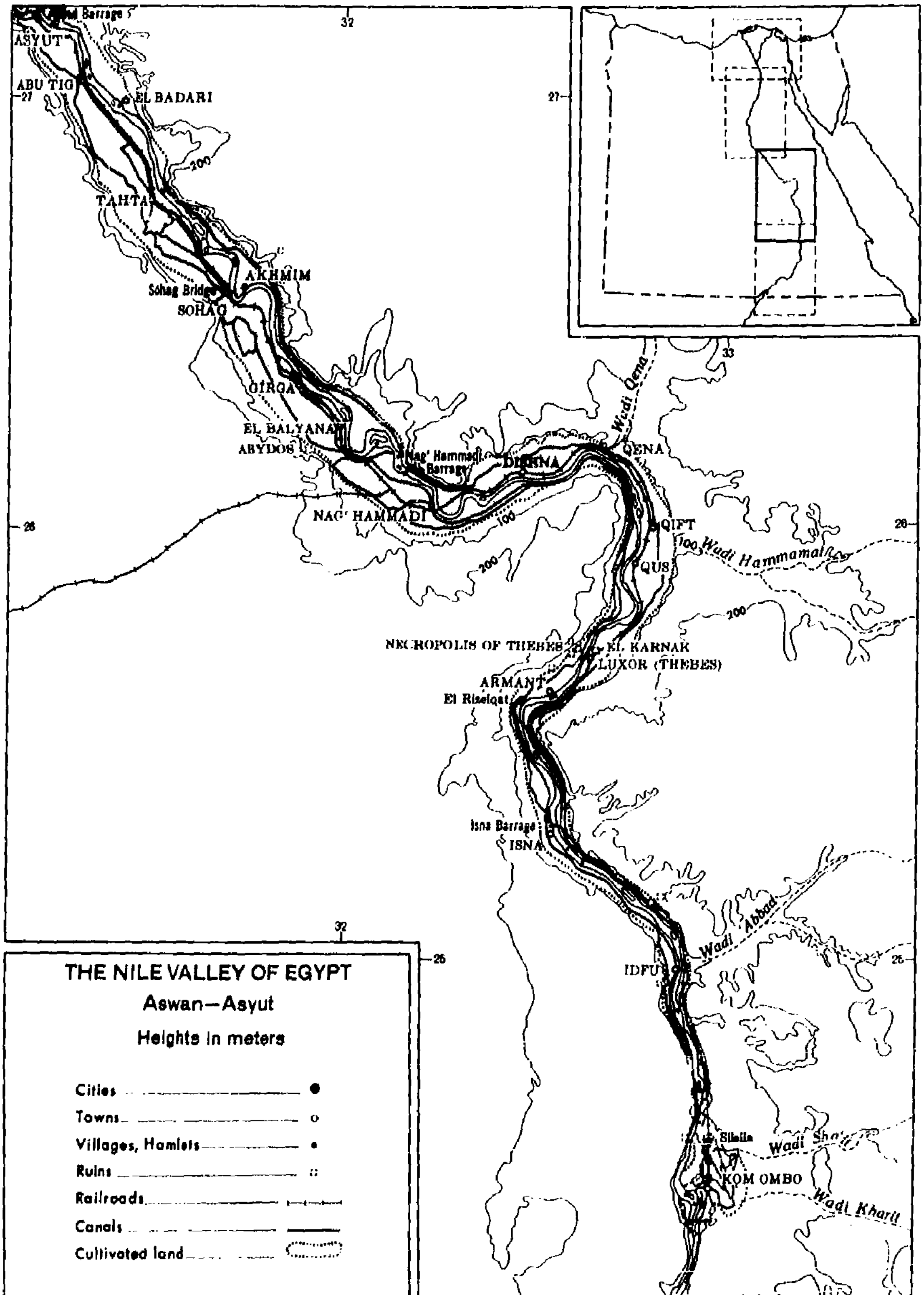
The Isna-Nag' Hammadi Section

Near Isna, 35 miles north of Idfu, a distinct geological and physiographical change in the channel of the Nile and its valley and flood plain occurs. There the Nubian sandstones give place to limestone formations. The valley loses its trench-like character completely, broadening out to a plain with an average width of somewhat more than 12 miles. White, calcareous cliffs of the limestone plateau hem in this part of the valley. Through it the river winds in meanders several miles in length. At Isna is the first of the barrages, built across the Nile below the Aswan Dam, by which the level of the river is held high enough during its low-water season to maintain a steady flow into the canals that take off above them.

The great eastward-bulging Qena Bend occupies about three-fourths of this section of the valley. The distance by river between Isna and Nag' Hammadi is 110 miles (177 km.), as compared with the straight-line distance of 55 miles (88 km.). Here the greater part of the valley is dominated by Cretaceous limestone formations, with rather soft constituents of chalk and shales, which farther north are buried beneath the hard Eocene limestone. The brown marl into which the shale disintegrates is used locally for fertilizer. Mud islands begin to appear in this section of the river and are a common feature of its channel all the rest of the way downstream.

Between Isna and Luxor, which stands a few miles downstream from the south end of the Qena Bend, is the most conspicuous contrast between the east and west borders of the valley. There the eastside plateau rises with steep escarpments close to the river. Its 2037-foot (621-meter) Gebel el Shaghab, a ridge of Cretaceous beds capped with Eocene limestone, is the highest mountain along the whole length of the valley in Egypt. The bulk of the agricultural land is, consequently, on the west side of the river, and between it and the escarpment of the limestone plateau of the Western Desert is a gravelly plain, more than 10 miles wide, dotted with low hills of shales.

The youthful Nile cut its Qena Bend around a southwest-northeast trending anticline (outlying from the limestone plateau of the Western Desert) known as the Theban anticline, from the ancient capital of the Pharaohs whose site is now partly occupied by the town of Luxor.[3] But it was the Wadi Qena that turned the course of the Nile west and southwest from the northeast apex of the Bend. This wadi, largest of the trunk wadis of the Eastern Desert, was discharging heavily during the rainy period of the



THE NILE VALLEY OF EGYPT
Aswan—Asyut
Heights in meters
Cities
Towns
Villages, Hamlets
Ruins
Railroads
Canals
Cultivated land
ASYUT
ABU TIG
EL BADARI
TAHTA
AKHMIM
Sohag Bridge
SOHAG
GIRGA
EL BALYANA
ABYDOS
Nag' Hammadi Barrage
NAG' HAMMADI
DISHNA
QENA
Wadi Qena
QIFT
QUS
Wadi Hammamat
NECROPOLIS OF THEBES
EL KARNAK
LUXOR (THEBES)
ARMANT
El Riseiqat
Isna Barrage
ISNA
IDFU
Wadi Abbad
Silsila
KOM OMBO
Wadi Kharit
ASWAN
Aswan Dam
El Shallal

Pliocene and early Pleistocene, when this section of the Nile valley was being cut. Its discharge and the delta it was building at its mouth served to deflect the Nile from what might otherwise have been a northerly course from this point on.[4]

From Luxor downstream the layout of the valley is the reverse of that of the Isna-Luxor section. Here it is the escarpment of the westside plateau and the range, 400 to 500 feet high, formed by the Theban anticline, that rise close to the river. The eastside plateau correspondingly retreats, leaving between it and the river a rather open country broken by low, isolated hills where the Cretaceous chalks and shales have been exposed.

From about 2150 B. C., when the first Pharaoh of the Eleventh Dynasty chose Thebes as his seat, until it was sacked by the Assyrians in 663 B. C., the Qena Bend was the spiritual heart of Egypt, and except for brief periods its administrative center. But even before the Pharaohs made Thebes their capital and began to build in and around it their temples and tombs, there were prosperous centers of trade and handicrafts where the present towns of Qena, Qift, and Qus now stand. The Qena Bend is the nearest approach of the Nile valley to the Red Sea. From it the Wadi Qena and another great trunk wadi, the Hammamat, provided caravan routes by which the Pharaohs transshipped to the Nile valley the treasure brought to their Red Sea ports from the Persian Gulf and the east African "Land of Punt." Quseir and Safaga, on the sites of two of these ports, are today connected with Qena by a road passable for motor vehicles, although it is now little used.

The Qena Bend region has some of the richest agricultural land of the whole Nile valley and is densely populated. Qena (population 42,429 in 1947) and Luxor (24,457) are its principal urban centers. Qena, capital of the province of the same name, at the mouth of the Wadi Qena, is well known throughout Egypt for its "Qena pottery," made from the exceedingly fine clay deposited toward the center of a gulf of the Mediterranean that flooded the lower reaches of the Wadi Qena in Pliocene times. Pottery making and sugar milling are the principal industries of Luxor, but it is best known for the Theban antiquities in and around it.

Nag' Hammadi to Asyut: The Nile Ravine

The Qena Bend ends at the village of Nag' Hammadi, where the Nile, which has been running south-southwest from the apex of the bend, turns sharply to the northwest. The Nile valley from here on to the head of the delta is cut in the Eocene limestone plateau and is, for the most part, at its maximum width in Egypt. From here on, also, to within a few miles of Cairo, the river leaves only a narrow strip of flood plain on its east side and in places washes against the base of the bordering cliffs. Most of the arable land is, consequently, west of the river.

Between Nag' Hammadi and Asyut, a distance by the river of 140 miles (228 km.), the valley is cut through a section of the limestone plateau of almost horizontal structure, and takes the form of a broad, flat-bottomed

trougn averaging nearly 15 miles wide, known as the Nile ravine.[5] Precipitous escarpments, rising to a uniform height of nearly 1000 feet above the valley floor and broken only by a few minor wadi mouths, hem it in on each side. By way of one of these wadis on the west side, the 122-mile, narrow-gauge railroad to the Kharga Oasis of the Western Desert enters the valley to connect with the main line a few miles north of Nag' Hammadi.

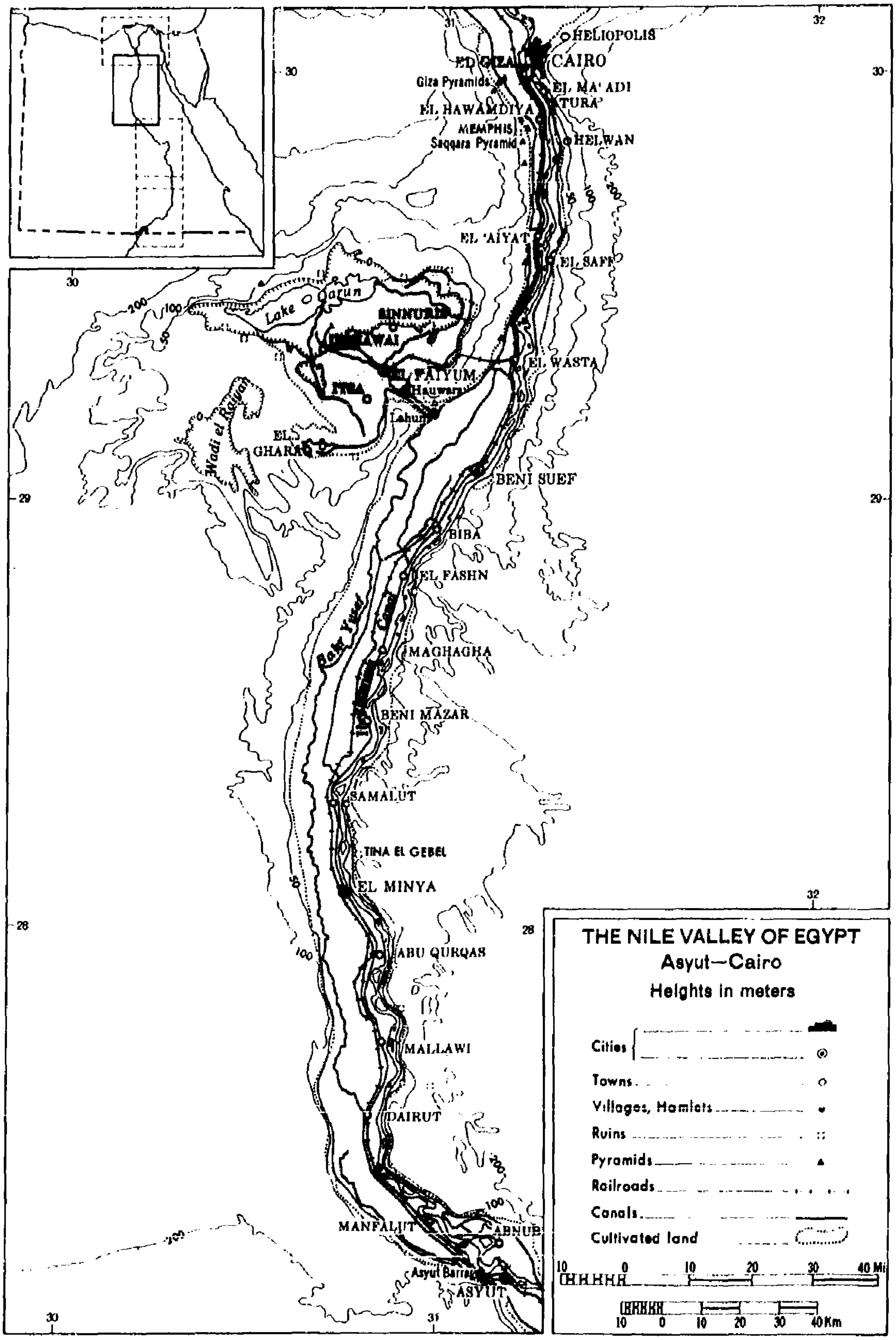
The flood plain of the river in this section of the valley is from 10 to 13 miles wide. Served by the Nag' Hammadi Barrage, the second of the barrages across the Nile below the Aswan Dam, it contains somewhat more than a fourth of the valley's total acreage of cultivated land. Indeed, it is the most intensively cropped and densely populated section of the valley. The concentration here of six towns of over 30,000 population [6] is duplicated nowhere else in Egypt in an area of corresponding size. This section contains all of the province of Girga, Egypt's most densely populated province, and the almost equally populous southern half of Asyut province.[7]

Cotton and sugar are important cash crops in this section of the valley, and the principal industries of the towns of Girga province are cotton ginning and the production of raw sugar for final refining at the country's only refinery at Hawamdiya, at the northern end of the valley. Pottery making and cotton spinning and weaving, mainly as cottage and small shop industries, are of considerable importance in all these towns. Akmin is especially noted as a center for hand-loom weaving of wool and silk, as well as of cotton. Nag' Hammadi, an agricultural village of about 8,000 population, just over the boundary in Qena province, is of interest chiefly as the point where the valley railroad, which parallels the west side of the Nile from Cairo, crosses the river to follow the east side to its terminus at Shallal.

Asyut is the largest city of the valley and its leading industrial and commercial center. Its numerous factory and handicraft industries are a principal source of supply for a large part of the Nile valley. Evidence of its importance as a distribution and marketing center is to be seen in the double tracking of the railroad from Cairo to Asyut. It is connected with the Kharga Oasis of the Western Desert and thence with the Dakhla, Bahariya, and Farafra oases by the famous old caravan track of Darb el Arba'in. This track continues on from Kharga to northern Sudan; over it, centuries before the building of the valley railroad, ivory and ebony and other cabinet woods were brought up from the Sudan to the craftsmen of Middle Egypt. Asyut is still noted for its inlay work and ivory carving. It was to this section of the valley that the Copts fled from persecution in Roman times and again during the early days of Arab rule. Asyut has a large concentration of Copts.

The Valley between Asyut and Cairo

The town of Asyut marks the northern end of the Nile ravine. From there on for the 215 miles (346 km.) to the head of the delta the valley is in its most open section. On the west side the plateau scarp is separated from the flood plain by a vast expanse of gravel, sand, and marl nowhere more than 400 feet above sea level, except where it is broken by small limestone mesas and the low ridge shutting off the Faiyum and Rayan depressions on the east.



THE NILE VALLEY OF EGYPT
Asyut—Cairo
Heights in meters
Cities
Towns
Villages, Hamlets
Ruins
Pyramids
Railroads
Canals
Cultivated land
10 0 10 20 30 40 Mi
10 0 10 20 30 40 Km
HELIOPOLIS
CAIRO
EL GIZA
Giza Pyramids
EL MA'ADI
TURA
EL HAWAMDIYA
MEMPHIS
Saqqara Pyramid
HELWAN
EL 'AIYAT
EL SAFF
Lake Qarun
SINNURIS
EL FAIYUM
Hauwara
Lahun
EL WASTA
Wadi el Raiyan
EL GHARAQ
BENI SUEF
BIBA
EL FASHN
Bahr Yusef
MAGHAGHA
BENI MAZAR
SAMALUT
TINA EL GEBEL
EL MINYA
ABU QURQAS
MALLAWI
DAIRUT
MANFALUT
ABNUB
Asyut Barrage
ASYUT

The scarp of the limestone plateau on the east side is not only low (600 to 700 feet high) but is broken by many wadi mouths. Although much closer to the flood plain of the river than the western scarp, the eastern scarp stands for the most part 10 to 15 miles from it. Only as Cairo is approached is it to be seen rising nearer the river.

For the 150 miles (241 km.) between Asyut and the town of Beni Suef the flood plain averages 12 to 13 miles wide and in places reaches 15 miles. All of it is on the west side of the river; on the east side, between the high Nile embankment and the foothills at the base of the limestone plateau, occurs only a stretch of barren gravel. The flood plain here is the most extensively and effectively irrigated of any section of the Nile valley. It contains more than a third of the cultivated land of the valley, all under perennial irrigation, with cotton, corn, and wheat the leading crops. The Ibrahimiya Canal, which waters it, is Egypt's largest irrigation canal - nearly 200 feet wide for most of its length and 195 miles (314 km.) long from where it leaves the Nile above the Asyut Barrage to Aiyat, where it empties its surplus water into the Giza Canal. The Asyut Barrage, completed in 1902 just below the town of Asyut, was built to maintain water level at sufficient height to keep it in full supply during the summer low-water period of the Nile.

Here, as in the Nile ravine, a large number of good-sized towns lie within a few miles of each other. El Minya (population 70,298 in 1947) and Beni Suef (57,106), capitals, respectively, of the provinces of the same names, and Mallawi (35,624, in Asyut province, are the chief towns; there are five others with populations of between 15,000 and 25,000. Cotton ginning, flour milling, and other processing of agricultural products are the principal industries.

Immediately north of Beni Suef the valley begins to narrow, and from El Wasta, 18 miles below Beni Suef, to Cairo, 50 miles beyond, it averages only 5 miles wide. The river widens here and meanders in the middle of the flood plain, with the cultivated land of about equal width on either side. On the east side the escarpment of the limestone plateau begins to encroach on the valley; at Helwan, 15 miles south of Cairo, its 700-foot cliffs stand only 8 miles from the river, and at Tura, 8 miles farther north, they are only 2.5 miles from it. On the west the broad plain is a rolling terrain of gravel and sand averaging 400 feet above the sea.

This section of the valley thrives with activities catering to the Cairo-Giza metropolis. Orchards and truck, dairy, and poultry farms figure largely in agricultural land use. Motor roads and railroad afford close contact with the city markets, and the barges and sailboats loaded with the agricultural products and manufactures of the valley throng the Nile. Helwan (population about 13,000), a few miles east of the narrow fringe of cultivated land and close to the limestone escarpment, owes its settlement to the occurrence of numerous mineral springs in the vicinity. These and the dryness and purity of its air have made it a famed health resort. Between Helwan and Cairo is an almost continuous chain of

manufacturing establishments, which are gradually invading Helwan itself, where the government proposes to build an iron and steel plant using ore from the Aswan deposits (see Chapter 9, Manufacturing).

The importance of this section of the Nile valley as the gateway between the valley and the delta has been recognized since ancient times. From this strategic position the early dynasties united and held the valley and delta as a single kingdom. The remains of Memphis, the first capital of united Egypt, are now a barren mound on the desert west of the Nile, 10 miles south of Giza. The choice by the Arab conquerors of various sites around Cairo and finally of Cairo itself for their capitals reflects the military, administrative and economic importance of this gateway.

The Faiyum Depression

The Faiyum is a great depression with a maximum depth of 174 feet below sea level, about 15 miles west-northwest of the town of Beni Suef. Although it belongs geologically and physiographically to the Western Desert (see section on the Western Desert in this chapter), from every other point of view it is an integral part of the Nile valley, and its occupied section is administered as one of the valley provinces.

Early in Paleolithic time, some 70,000 years ago, an arm of the Nile, then at a much higher level than at present, breached the low divide which separates the Faiyum from the valley in what is known as the Lahun gap. Since then the Nile has watered it, and Nile silt forms its cultivable land. Nile water, pouring into the Faiyum, formed a huge lake whose surface reached 130 feet above the present level of the sea.[8] The free flow of Nile water through the gap it had breached continued until the late Paleolithic (about 8000 B.C.). But during much of that period the levels of the Mediterranean Sea and of the Nile were falling in successive stages, and the lake declined correspondingly. The rich remains of human habitations left in the resulting succession of gravel terraces around the lake have been the subject of much archeological investigation.[9]

Before the dawn of recorded history in Egypt the Lahun gap had silted up to the narrow passage through which a natural channel, the Bahr Yusef, still carries Nile water into the depression. The Bahr Yusef originally took off from the Nile near the present town of Dairut, 40 miles north of Asyut, but when the Ibrahimiya Canal was dug it was connected with the canal and its Nile take-off was closed. The Faiyum is thus entirely dependent on the Ibrahimiya Canal for its water supply (see Chapter 5, Irrigation).

Agriculture in the Faiyum is believed to be as ancient as it is in the Nile valley. What are possibly the world's oldest water engineering works were those carried out there in Pharaonic times, notably during the reign of Amenemhat I of the Twelfth Dynasty. A large section of the depression was converted into a great reservoir, later named Lake Moeris by the Greeks, to provide both flood protection and irrigation water for the lower valley and the delta. It served as an outlet for Nile water during the flood period of the river, and the water thus stored was released back into the

Nile for irrigation during the period of low water.[10] The land around the reservoir was also cultivated under flood irrigation.

During Ptolemaic and Roman times the Faiyum was the "Garden of Egypt." A great masonry embankment and barrage, of which the remains are still to be seen, was built across the Lahun gap and the flow of the Nile so controlled there that the level of Lake Moeris was lowered below the present sea level, leaving an extensive area for reclamation around it. The extent of this reclamation is revealed by the remains of canals, tunnels, a cistern, and wells dug in the lacustrine clay in what is now a desert waste beyond the borders of the cultivated land.

The Faiyum was one of the first sections of Egypt to feel the effects of the decline of the Roman empire. Only by highly organized and carefully controlled operation could its complicated irrigation system be maintained. So neglected was the operation of the Lahun Barrage that by the middle of the fifth century the fringe settlements had been abandoned for lack of irrigation water. From then on the area under cultivation shrank progressively.

It was not until the late nineteenth and early twentieth centuries that the Faiyum began to prosper again. The completion of the Asyut Barrage in 1902 to maintain the flow of water into the Ibrahimiya Canal during the low-water period of the Nile, the connecting of the Bahr Yusef with this canal, and the restoration of the old Lahun Barrage and the construction of a regulator a few miles upstream gave the Faiyum its first assurance of a dependable and controlled supply of irrigation water in 1400 years. Reclamation of long-abandoned farmland followed rapidly. Today the area in the Faiyum under crop is 15 per cent of the total in the provinces above the delta. It still has more land capable of reclamation than does any other of these provinces, and cultivation is gradually being extended.

The lake, now a shallow brackish body known as Birket Qarun (Lake of Horns) along the northwest side of the depression, is maintained by drainage into it and evaporation from it at a fairly well-balanced level of about 148 feet below sea level. At that level it is twenty-five miles long and six miles wide at its greatest width and occupies an area of nearly eighty-five square miles.

Most of the land in the Faiyum slopes appreciably toward the lake and consequently is easily irrigated and drained. The exceptions are a fringe around the lake and the Gharaq lowland in the southwestern part of the depression. There pumps must be used in places for both irrigation and drainage, and soil salinity is a problem. Considerable use is made of the gradient in the irrigation canals for operating primitive flour mills and in a few localities for small hydroelectric generators. About two-thirds of the water supply comes into the depression through the Lahun Barrage and the remainder by way of an artificial channel, the Wafis Canal, which takes off from the Bahr Yusef above the barrage. Drainage is all into the Birket Qarun.

A pronounced escarpment borders most of the depression. Southeast of the lake and standing at about five miles from it, this escarpment stretches unbroken for some eighteen miles. Between the escarpment and the lake is a chain of settlements, of which Sinnuris (population about 23,500) and Ibshawai (about 7300) are, respectively, the second and third in size of the towns of the province. The orcharded terraces and shaded, gully-like irrigation canals of this section of the Faiyum are in distinct contrast to the monotonous green flats of the valley proper and the delta. On the northern side of the lake, barren land rises to a bold escarpment that reaches heights of over 1000 feet above the sea.

The area of the Faiyum depression is generally taken as that below 25 meters (82 feet) above sea level - nearly 890 square miles. The area administered as the province of Faiyum is 670.5 square miles, the greater part of which lies below the 20-foot contour above sea level. The Faiyum is thus fifth in area of the eight valley provinces, but only Aswan is less densely populated (see Chapter 3, People and Society). The Faiyum has more alluvial land, however, that could be reclaimed for agriculture if sufficient irrigation water were supplied than does any of the other valley provinces.

As elsewhere in the valley, grain and cotton are the Faiyum's principal crops, but agriculture there profits rather more from sidelines than anywhere else in Egypt. Faiyum chickens are well known in the urban markets for their size and quality, as compared with the poor type to which the Egyptian chicken has in general degenerated (see Chapter 4, Agriculture); its waste land provides pasture for a breed of sheep so good as compared with the general run of Egyptian sheep that it carries the name of the province. The Faiyum, indeed, is well on its way to becoming again the "Garden of Egypt." Its acreage in limes, figs, grapes, dates, olives, and prickly pears is greater than that of any of the other valley provinces, and its products are noted throughout the country for their superior quality. Good rail and road connections with the valley trunk routes and a direct road across the desert to the Cairo-Giza metropolis provide speedy transportation of orchard products to both valley and delta markets.

Fishing in Birket Qarun is still an industry of considerable importance, although it has declined rather seriously in recent years, owing apparently to the increasing salinity of the water. During the fifteen-year period 1921-1935 the average annual catch was 2037 tons and fishing was the principal occupation of about 2700 men and boys with a fleet of nearly 300 boats. Since then the catch has diminished, according to the latest available reports, to little more than 1500 tons a year. About three-fourths of the fish taken is bolti, chiefly Tilapia zillii and Tilapia nilotica, the latter the most common of the Nile River fish. The remainder is mainly gray mullet (Mugil capito), a fish introduced some years ago to replace the Nile perch (Lates nilotica), which at one time constituted a major portion of the catch but is now rarely caught.[11]

Since early times a succession of towns has occupied the present site of Faiyum, the capital of the province. The Pharaonic town was called Crocodilopolis by the Greeks because of its temple to a crocodile god kept in

the lake. Mounds north of the city are the remains of the Ptolemaic town of Arsinoë. With a population of 73,643 in 1947, Faiyum is exceeded in size among the valley towns only by Asyut. In addition to its importance as the market and distributing center for the agricultural products of the province, it is second only to Asyut as a manufacturing center, with wool and cotton spinning and weaving, cotton dyeing, tanning and cigarette making the principal industries.

The Cairo-Giza Metropolitan Area

A short distance south of Cairo the Nile valley begins to open out into the delta. East of the city, the 700-foot scarp of the Moqattam Hills, at the north end of the limestone plateau, drops off abruptly to the sandy plain that borders the delta on the east all the way to the coastal lagoons. West of the river the gravel hills recede until, just north of Cairo, the valley is in a broad plain over fifteen miles wide. The river, here at its widest and broken by several large islands, keeps to the east side of the valley floor. The cultivated land is west of the river and reaches a width of eight miles opposite Cairo.

Since ancient times this junction of valley and delta has played a commanding role in the various conquests of the country and in its administration, industry, commerce, and communications. Across the river southwest of Cairo are the Great Pyramids and the ruins of Memphis, the capital from which the Pharaoh Menes united the kingdoms of Upper and Lower Egypt. There is evidence that the apex of the delta was then farther south than at present and that Memphis was built on a pronounced westerly bend of the river.[12]

Memphis continued to hold its preëminence in commerce and trade even during the period when the Pharaohs had their seat at Thebes. During the periods of Ptolemaic rule and Roman occupation, although Alexandria became the administrative capital of the country and ultimately surpassed it in size, Memphis was still the largest native city. Only after the conquest by the Arabs and their choice of a more strategic site protected by the Moqattam Hills on the east bank of the Nile was Memphis abandoned, although, because of the shifting of the channel, it had long since lost its riverside location.

East of the Nile, in what is known as Old Cairo, still stand the towers and wall of a fortress built by the Romans on the site of a Persian town called Babylon by the Greeks. Nearby are the sites of a succession of capitals built by the Arabs before the establishment of Cairo itself: Fustat, founded in 640 A.D. by 'Amr, the Arab conqueror of Egypt, and now marked by the latest of a succession of mosques built on the site of a mosque he built; a mound that is all that remains of the town of 'Askar, built as his seat by a Caliph of the succeeding Abbassid Dynasty in 751 A.D.; and the mosque, now restored and one of the sights of Old Cairo, that Ahmad ibn-Tulud, founder of the Tulunid dynasty, built when he moved his seat to Qatai', a suburb of 'Askar.

But long before the Persian conquerors built their town of Babylon, there were settlements on this east side of the Nile. The village of Mataria, just north of the residential suburb of Heliopolis, six miles northeast of Cairo, is on the site of a town called On by the early Egyptians and Heliopolis (City of the Sun) by the Greeks, where the Pharaohs worshipped their sun god in his most sacred temple. This side of the Nile was also at various times an entrepôt for the cargoes brought into the valley towns by canal from the Gulf of Suez (see Chapter II, The Suez Canal). It would appear likely that when the first of these canals, the so-called "Canal of the Pharaohs," probably dug during the twelfth Dynasty (2000-1782 B.C.), connected the ancient Pelusiac Branch of the Nile with the Gulf of Suez, there were piers and a port settlement nearby, as there must have been when one or another of the conquerors of Egypt restored this canal or dug a new one. Khaleeg Street, which now traverses Cairo for five miles from south (Old Cairo) to north (Daher district) and marks the frontier between the old city and the new, occupies the filled-in course of the old Khaleeg Canal, which connected the Arab conqueror 'Amr's restoration of the "Canal of the Pharaohs" with the main stream of the Nile.

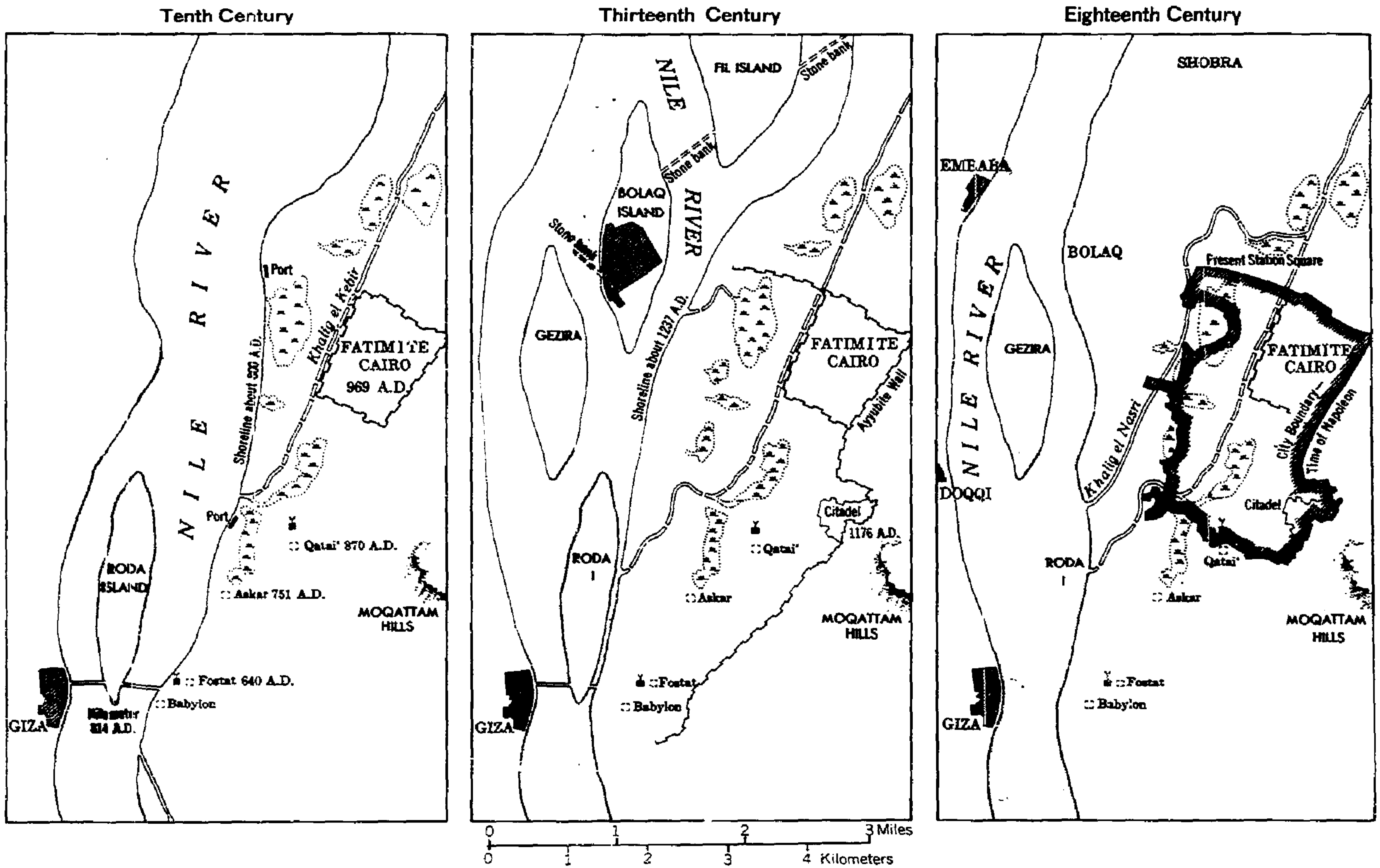
The founding of El Qahira (Cairo is a corruption of the Arabic name meaning "The Victorious") dates from the Fatimite conquest in 960 A.D. The location chosen for the town was on high ground near the escarpment of the Moqattam Hills. The course of the main channel of the Nile was then much farther east than now, and the annual flood of the river inundated not only the land between it and the Khaleeg Canal but a wasteland of lagoons and marshes between the canal and the city walls. Although between the ninth and fourteenth centuries the Nile shifted gradually westward to approximately its present position, not until the Khaleeg and the lagoons and marshes had been filled in late in the nineteenth century did the new, west side of the city begin to develop..

Fatimite Cairo was a fortified city enclosed first with a brick wall and later, as it expanded north and south, with a succession of walls of stone. To it the Caliph Mo'izz, for whom Egypt had been conquered from the Tulunid Caliphs, moved his headquarters in 973 A.D. from Kairawan in Tunisia, and from it he claimed under his suzerainty Egypt's most extensive "empire" of all time. The essentially military character of the early city and its strategic position, commanding the valley and delta from the shelter of the Moqattam Hills, were recognized by Saladin. Having ousted the Fatimites in 1171 and founded the Ayyubid Dynasty, he built the famous Citadel in Cairo as his headquarters.

Cairo dates its preëminence as the commercial and industrial center of the country from this period of the Ayyubid Caliphs. Merchants, artisans, and craftsmen of all nationalities and religions were encouraged to settle there and given many privileges. Ayyubid times are still reflected in the craft divisions of the old city - the alleys where goldsmiths, coppersmiths, leather workers, pottery makers, tent makers today ply their ancient trades. The bazaar of the Musky quarter, the mecca of every tourist, hums with activities that stem from that period.

THE DEVELOPMENT OF CAIRO

Shaded area indicates the present course of the Nile



For nearly 900 years, however - until the Cairo-Suez railroad was completed in 1856 - Cairo had no connection with Egypt's eastern neighbors except by caravan.[13] Until Mohammed Ali opened his Mahmudiya Canal in 1820 to provide a barge way between the valley and the port of Alexandria, Cairo's only connection with the Mediterranean was by caravan and intermittent barge transport on the Rosetta and Damietta branches of the Nile through the delta. When Ismail (Governor-General 1863-1867 and Khedive 1867-1879) succeeded to the Governor-Generalship, the railroad to Alexandria had also been built and the stage was set for the development of Cairo to become the hub of the country.

Indeed, the growth of modern Cairo may properly be said to date from Ismail's reign. His ambition was to bring his country more closely into the European orbit, and the approaching completion of the Suez Canal made the time especially auspicious for the creation of a city that would impress the visiting dignitaries at the opening festivities.

The deserted marshlands between the Nile and the Khaleeg Canal were filled in with refuse and rubble from the old quarters. Wide avenues were laid out on the reclaimed land and lined with residential palaces and other fine buildings. The government offices were moved to new buildings from the Citadel, where they had been ever since Saladin had first installed his headquarters there. Many of the palaces and monumental construction of present-day Cairo-the Opera House, the house of the Geographical Society, and the road to the Great Pyramids-date from that period. Ismailiya District, planned by Ismail and named for him, is still one of the main business sections of the city.

Ismail's successors followed his example. By the end of the nineteenth century the Khaleeg Canal, which up to 1899 still supplied Cairo with water, was completely filled and the city stretched to the right bank of the Nile. The westward expansion has continued during the present century. The towns of Giza, Doqqi, and Aguza west of the river have been developed and so connected by bridges as to become integral parts of the Cairo metropolis, as are the two islands of Gezira and Roda.

Cairo is today not only the largest city in Africa but the largest in the Arab world. It has grown phenomenally in the last two decades and particularly since World War II. Its population, as reported in the national censuses of 1927 and 1947, nearly doubled between these two censuses. The 1947 census, in which it was enumerated as 2,090,654, showed an increase of nearly 60 per cent over that of 1937. Its present population is estimated as around two and a half million.

In no other large city in the world is the history of so great a span of years so clearly visible and in no other are the traditional and the modern, the old and the new, so intricately intertwined. There could scarcely be a greater contrast than that between the modern business districts of Ismailiya and Tewfiqiya and the shops and bazaars of the medieval Musky section; between Garden City, with its well-planned streets lined with houses and apartment buildings, and the old native quarter of Sayeda Zeinab, where

thousands of families are crowded in ancient buildings huddled together along tortuously winding alleyways; between Zamelek, a spacious modern residential section on the northern end of Gezira Island, and the teeming town of Bulaq, which faces it across the Nile.

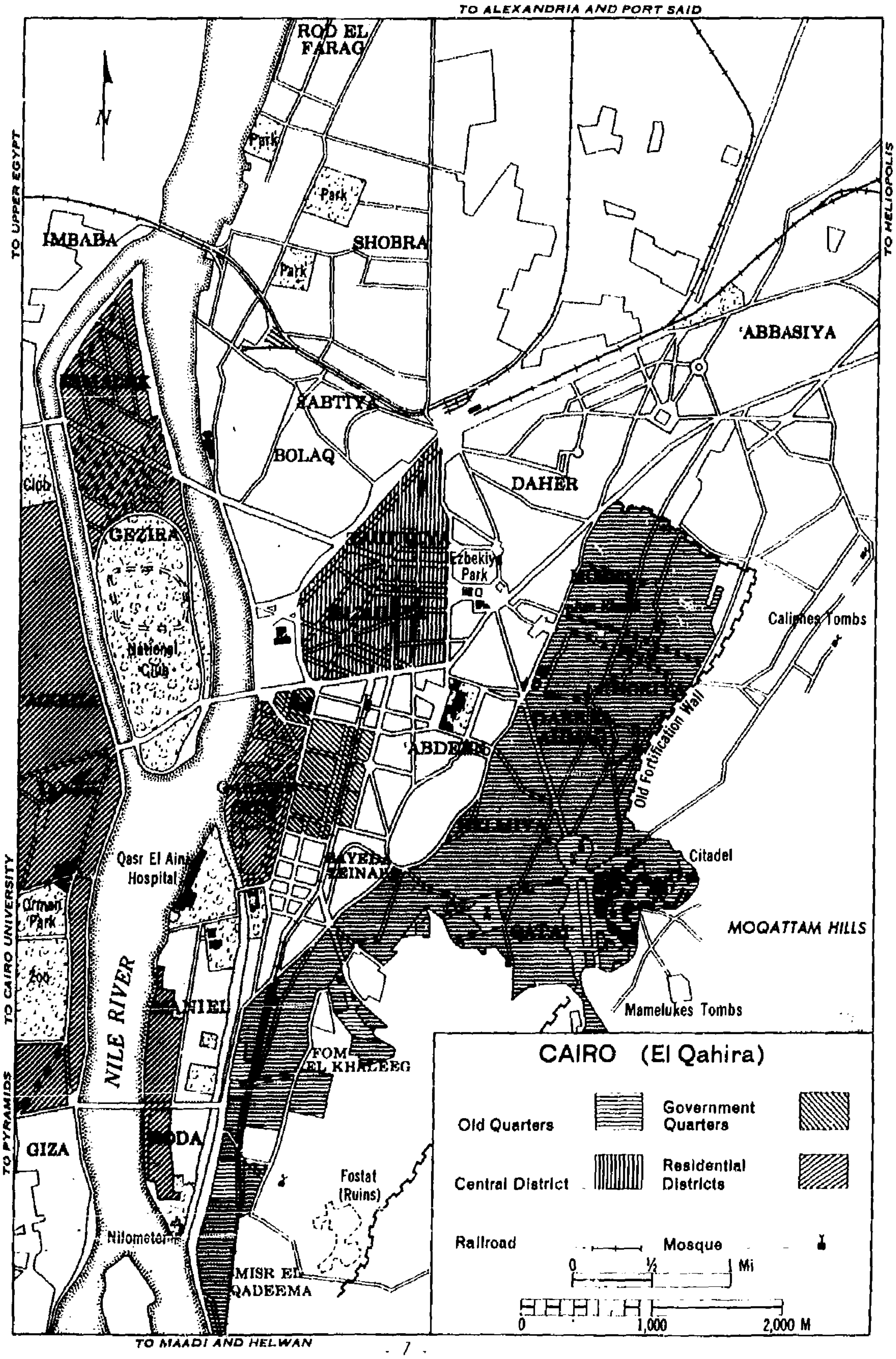
Fast interurban trains and well-paved roads connect Cairo with Heliopolis, Giza, Ma'adi, Helwan, and other suburbs. A few miles northeast of the city is one of the world's most important international airports, and nearby is the Almaza Airport from which Egyptian-owned airlines fly annually nearly 400,000 miles in Egypt, carrying upwards of 1,000,000 kilograms of freight and baggage and between 40,000 and 50,000 passengers (see Chapter 10, Transport and Communications). But even in the most modern section of the city, freight-laden donkeys and camels, donkey carts and horse-drawn carriages, porters with pushcarts and heavy back loads still mingle with automobiles and motor trucks, and Nile sailing crafts with their pointed lateen sails moor side by side with motor barges. Men of the working classes, in gown and skull cap scarcely to be distinguished from the garb of the rural fellahin, sheiks in striking traditional costume, and even an occasional veiled woman rub shoulders with men and women in clothes that reflect the latest European styles.

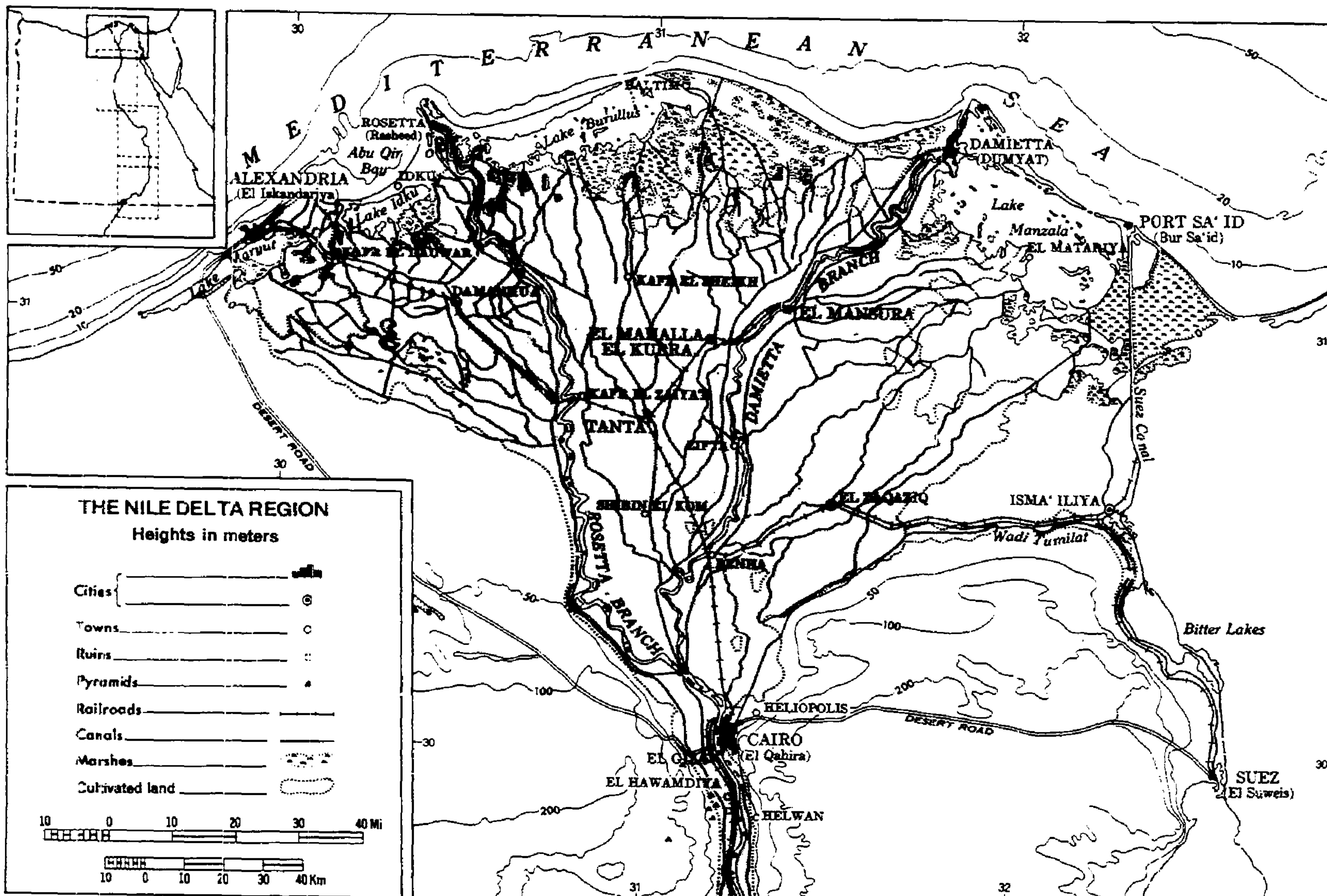
Until recently tolerance toward people of other nationalities and religions had long distinguished Cairo from other Arab capitals, and in fact set off Egypt as a whole from other countries of the Arab orbit. The role that Europeans and other outsiders have played in Cairo's development is visible in its numerous foreign quarters, synagogues and churches of many Christian sects, and foreign schools and colleges.

Like most European capitals, Cairo is not only the administrative center of the country but its cultural, financial, commercial, and business center and its leader in industrial development. Of the total of 19,527 more or less mechanized manufacturing establishments (as distinguished from craft shops and cottage industries) enumerated in the industrial census of 1951, Cairo, with 4307 had more than any other Egyptian city, and of the 307,443 persons who gave their occupation as owners, managers, or employees of this type of establishment, 82,284 lived and worked in Cairo.

THE NILE DELTA

North of Cairo the bordering limestone walls of the valley shrink and diverge from each other, and the river fans out into a number of distributaries. This is the delta of the Nile, a monotonous triangular plain that has been likened to the back of a leaf, for the river and canals stand out like veins above the adjoining lowlands. Although half the delta is still occupied by lakes and swamps, salt marshes and lagoons, the remainder contains the most fertile soil in Africa. The delta measures about 100 miles from its head to the sea and about 150 along the coast. Its area, 9650 square miles (about 25,000 sq. km.), including the coastal lakes, comprises a little more than three-fourths of the Nile land in Egypt and is nearly equal to the land area of the state of Maryland.


TO ALEXANDRIA AND PORT SAID
ROD EL FARAG
Park
Park
SHOBRA
Park
IMBABA
TO UPPER EGYPT
TO HELIOPOLIS
'ABBASIYA
SABTIYA
BOLAQ
DAHER
Club
GEZIRA
Ezbekiya Park
National Club
Caliphes Tombs
Old Fortification Wall
'ABDEEN
Citadel
Qasr El Aini Hospital
SAYEDA ZEINAB
Orman Park
Zoo
MOQATTAM HILLS
NILE RIVER
Mamelukes Tombs
FOM EL KHALEEG
TO CAIRO UNIVERSITY
TO PYRAMIDS
GIZA
RODA
Fostat (Ruins)
Nilometer
MISR EL QADEEMA
TO MAADI AND HELWAN
CAIRO (El Qahira)
Old Quarters
Government Quarters
Central District
Residential Districts
Railroad
Mosque
0 ½ Mi
0 1,000 2,000 M


THE NILE DELTA REGION
Heights in meters
Cities
Towns
Ruins
Pyramids
Railroads
Canals
Marshes
Cultivated land
10 0 10 20 30 40 Mi
10 0 10 20 30 40 Km
MEDITERRANEAN SEA
ALEXANDRIA
(El Iskandariya)
ROSETTA
(Rasheed)
Abu Qir
Bay
IDKU
Lake Idku
Lake Burullus
BALTIM
DAMIETTA
(DUMYAT)
Lake
Manzala
EL MATARIYA
PORT SA' ID
(Bur Sa'id)
KAFR EL SHEIKH
EL MANSURA
DAMANHUR
EL MAHALLA
EL KUBRA
KAFR EL ZAIYAT
TANTA
DAMIETTA BRANCH
ROSETTA BRANCH
SHIBIN EL KOM
EL ZAGAZIQ
BENHA
ISMA' ILIYA
Wadi Tumilat
Suez Canal
Bitter Lakes
HELIOPOLIS
DESERT ROAD
CAIRO
(El Qahira)
EL HAWAMDIYA
HELWAN
SUEZ
(El Suweis)

The Delta Land

The delta conforms in outline to a gulf of the Pleistocene Mediterranean and consists of mud that has been laid down since that period by the Blue Nile and the Atbara River. These streams have brought into the mainstream of the Nile the silt from the Ethiopian highlands with which their flood waters are heavily loaded (see Appendix I, Geology). Although there is some merging of the dark alluvial land of the delta with the light-colored sand of the bordering desert, it is nowhere sufficient to obscure the line of contact between them.

The average thickness of the alluvium is 65 feet, but it varies in depth with the configuration of the sea floor on which it has been laid down. It tends, naturally, to be heaviest and thickest at the south end of the delta and near the two branches that now carry Nile water to the sea. But even in the southern part of the delta an occasional sterile sandy mound, once an offshore island in the ancient Mediterranean gulf, still stands above the alluvium.

North of Cairo, the Nile veers toward the northwest, and about ten miles from the city bifurcates into its two present delta branches - the Damietta (Arabic Dumyat) or eastern branch, and the Rosetta (Rasheed) or western branch. Both are winding streams of considerable width. The Rosetta, 150 miles long, averages 1640 feet wide, and the Damietta, a few miles longer, 885 feet. Of the delta land, 40 per cent is between these branches and 39 and 21 per cent, respectively, east and west of them. The eastern and western extensions of the delta land correspond to the extent of the Nile flood in ancient times, when not two, as now, but several branches carried the Nile water to the sea. As late as the first century A.D., Strabo reported the Nile as having seven branches,[14] and a twelfth century map by Idrisi, the Arab geographer, shows six branches but indicates a trend toward consolidation into the present two.[15] The most easterly of these, the Pelusaic, to which the early canal makers connected their waterways to the Gulf of Suez, at one time carried water as far east as Pelusium or Tina Bay, east of the present Mediterranean entrance to the Suez Canal.

Owing to the somewhat greater flow until fairly recent times of Nile water and Nile silt across the eastern side of the delta than across the western side, the surface of the delta slopes down slightly from southeast to northwest, but to all appearances it is a remarkably level plain. Its elevation at its apex is only a little more than fifty feet above the sea and its average slope only 1:10,000. A wide belt along the coast, called in Arabic "barari" (barren land), is so close to sea level that only by pumping for drainage and constantly battling against salinity can a large and much-needed acreage there be reclaimed for cultivation.

A considerable part of this coastal belt is occupied by four shallow, brackish lakes - from east to west, Manzala, Burullus, Idku, and Maryut. These lakes are separated from the sea by only a low sand belt varying in width from narrow bars to stretches several miles across. Besides serving

as outlets for most of the drainage from the cultivated land of the delta, these lakes support a fishing industry which supplies most of the fish on sale at the delta markets. Part of the catch is sold fresh in nearby urban centers; the remainder is salted for wider distribution. Matariya (on Lake Manzala), Baltim (on Lake Burullus), and Idku (on Lake Idku) are the principal fishing villages.

Lake Manzala (560 square miles) extends eastward from near the lower Damietta Branch to the Isthmus of Suez, where part of the land on which Port Sa'id stands was built up by filling in some of the eastern end of the lake. Lake Burullus (215 square miles) lies between the two Nile branches, and Lake Idku (55 square miles) faces the curve of Abu Qir Bay west of the Rosetta Branch. The surface of Maryut (76 square miles), south of Alexandria, is a few feet below sea level, but it is barred from the sea by limestone ridges.

The alluvial projections that the Damietta and Rosetta branches have built out at their mouths break the delta coast line into three smooth crescentic curves, of which Abu Qir Bay is the only indentation of any prominence. Cape Abu Qir, which marks its western limit, is the terminus of the limestone ridges that parallel the coast to the west (see section on the Western Desert in this chapter). The sea off the delta front is shallow and its floor gently sloping. Within ten miles of the coast it is nowhere more than 20 meters (65.6 feet) deep, and the 50-meter (164-foot) bathy-metric contour lies at an average distance of twenty-five miles offshore.

Since ancient times, the sinking of the delta's Pleistocene foundation has kept pace with the deposition of Nile silt. In spite of the enormous quantities of silt deposited there each year (until the present complete perennial irrigation of all the land under cultivation in the delta was well advanced) by the Nile flood, there has been no perceptible increase in the elevation of the delta above the sea. (See Chapter 5, Irrigation, and Chapter 4, Agriculture). Evidence of the subsidence of the delta foundation is to be seen in the ruins of Graeco-Roman settlements at or below sea level along the coast between Alexandria and Cape Abu Qir and in the remains of still more ancient settlements submerged in the coastal lakes or appearing as islands in the marshlands and lagoons around Lakes Burullus and Manzala.

Since records have been kept, there has been no seaward extension of the delta of any consequence, even though during the height of the Nile flood a large volume of silt-laden water is discharged through the Damietta and Rosetta branches. The west-east Gibraltar current along the African coast of the Mediterranean is so effective in carrying the Nile silt eastward that there is no perceptible accumulation of it except at the mouths of these branches. The bars it forms there are serious obstacles to coastwise vessels entering and leaving the ports of Damietta and Rosetta.

The Barari

The truly barren "barari" land of the northern border of the delta is a broad belt occupying somewhat more than a fourth of the delta, twenty-five

miles wide at its eastern end at Lake Manzala and decreasing in width westward to about ten miles at its western end. With an area of 2110 square miles (5465 sq. km.), or 1.3 million feddans, it is about twice the size of the state of Rhode Island. The salinity and generally water-logged condition of its soil and the lack of natural drainage keeps most of this area of potential farm land beyond the present limits of cultivation. The salt content is everywhere high; in places near Lakes Burullus and Idku it is as much as 14 per cent. Only along the courses of the Damietta and Rosetta branches is the barari land high enough for good drainage. Here, on strips bordering both sides of these branches, the cultivated land of the delta continues to the sea.

Few roads of any kind cross this dreary, inhospitable region of grayish soil, marshes, lagoons, and dense reed growth; wide tracts are completely without human habitation. During the summer and autumn flood of the Nile it is everywhere difficult of access, and even the scanty winter rains turn it into a muddy morass. The transition from arable land is, however, gradual; patches of alkaline soil appear, the areas under cultivation grow progressively smaller and less productive, and signs of human habitation become more and more sparse. Rice is the principal crop of the transition zone, owing to its tolerance of soil salinity and its high water requirement.

Reclamation of the barari, to which Egyptians look hopefully for a major addition to their arable land, has been undertaken on any large scale only within the last thirty or forty years. Its ultimate success depends on complete control of the Nile flood. The task of reclamation is so costly and must be on such a large scale to be successful that it can be undertaken only by big landowners, land companies, or the government. Recruitment of the large labor force required is in itself a problem, because the region is so sparsely populated that most of the workers must be brought in from considerable distances. Under present conditions, reclamation is a highly speculative venture at best. Even when the land is brought to crop-producing condition, constant attention is necessary to keep it so.

Ten to fifteen years of continuous work are required to prepare the land for cultivation. The reclamation process involves elaborate drainage works in which recourse to pumping is commonly necessary. Natural growth must be cleared, salt washed out by repeated flooding, and drainage canals and ditches systematically maintained. Cultivation begins with one or more plantings of a highly salt-tolerant crop (usually berseem, the quick-growing Egyptian clover) before other crops are attempted.

In addition to the obvious benefit derived from the increase in cultivable land, large-scale reclamation projects in the barari belt have introduced a superior type of rural settlement, quite different from the usual hamlet of the Egyptian farmer - with well-planned compounds with houses for the workers, offices for the management, stables, and workshops for implement repair. The workers' houses, built of baked brick, cement-roofed, and with windows and sanitary facilities, have little in common with the primitive, mud-walled shelters of the great majority of rural Egyptians.

Plans for further reclamation in this section of the delta include proposals for some drainage of the lakes. In Lakes Maryut and Idku fairly large tracts have already been reclaimed and are now under cultivation.

The Barari Towns

Two towns, Damietta (population 53,631 in 1947) and Rosetta (28,558), near the sea on the Nile branches, may be expected to prosper greatly, if and when further large areas of the barari land are reclaimed for agriculture. They owe their present size, however, rather to their inheritance from the past, when as maritime-riverine ports, they were the main Mediterranean gateways to the country than to any present importance as commercial or marketing centers. Although no longer of any consequence as ports, except for a little coastwise sailing-vessel trade, they still contain some survivals of the varied industries that developed in them when they were Egypt's chief entrepôts of foreign trade.

Rosetta (Arabic Rasheed), on the west bank of the Rosetta Branch about ten miles from its mouth, occupies the site of an ancient town called Bolbitine by the Greeks. Following the silting up of the other western branches of the Nile and of the canal by which the Ptolemies had connected Alexandria with the westernmost, or Canobic, Branch, Rosetta became important as a way station on the overland and water route between the Gulf of Suez and the Mediterranean. It maintained this position until 1820 when Mohammed Ali completed his Mamudiya Canal connecting Alexandria with the Nile. Rice mills along the river wharves and the salting of fish are Rosetta's present principal industrial activities.

Damietta (Arabic Dumyat), on the east bank of the Damietta Branch about eight miles from its mouth, is some four miles upstream from the original town, called Tamiatis in the ancient Coptic language of Egypt. Because of its proximity to the coastal trade routes of the Levant, Tamiatis was a thriving center of trade in silk, linen, dates, fish, and spices, exceeding Rosetta in the volume of its commerce and in its manufacturing industry. In the twelfth century its prosperity was further enhanced by the decline of the old silk-trade center of Tinnis farther east, owing to the latter's partial submergence in the rising water of Lake Manzala.[16] Louis IX of France, the Saint Louis of the Crusades, captured Tamiatis in 1249 A.D. After the French had been driven out, the Mameluke bey governing this section of Egypt destroyed the town and about 1260 relocated it on its present site, less vulnerable from the sea.

As in the case of the other coastal towns, Damietta suffered a decline after Mohammed Ali connected the Nile with Alexandria by his Mahmudiya Canal. But the creation of Port Sa'id, in connection with the construction of the Suez Canal, restored to Damietta a considerable measure of its former prosperity by providing a market and shipping point for its products. A motor road along the embankment that separates Lake Manzala from the sea and shipping on the lake link Damietta with Port Sa'id. Damietta has also profited by the development of the Ras el Barr summer resort at the mouth of the Damietta Branch. Damietta's principal industries today are those of

long tradition there - silk weaving, woodworking, leather working, and the making of confections. Many of their products are famous throughout the country. The importance of Damietta is indicated by its separation for administrative purposes from the province to which it would normally belong. It is one of five urban centers administered as governorates directly under the authority of the Minister of Interior.

The Delta Population

The 1947 census showed 44 per cent of the people of Egypt domiciled in the delta as compared to 36 per cent in the valley (outside the urban concentration in the Cairo governorate). The overall population density of the delta provinces was, however, only 996 per square mile, as compared to 1508 in the valley provinces. This difference is due in part to the fact that large tracts of uncultivated land on the borders of the delta are included in the border provinces. That the delta had only 2.3 persons per feddan of cultivated land as compared with 3 per feddan in the valley provinces is however, to be accounted for chiefly by the fact that a greater percentage of delta land than valley land is in large holdings.

On the other hand, whereas the urbanization of the delta, as indicated by the proportion of the population living in towns of over 25,000 in 1947, is no greater than that of the valley (about 11 per cent of the population of each), the development of modern mechanized industry there is reflected in the greater concentration of its population in large towns. In 1947 the delta had five towns of more than 80,000 population, of which three, Tanta, El Mahalla el Kubra, and El Mansura, had more than 100,000 each, while in the valley only Asyut, with 90,103, was in that category.

Of these towns - Tanta (139,126 in 1947), El Mahalla el Kubra (115,758), El Mansura (101,965), Damanhur (84,352), and El Zaqaziq (81,815) - all but one owe their size mainly to a combination of functions. Except for El Mahalla el Kubra they are provincial capitals and marketing centers for large and highly productive agricultural sections, and all have shown marked growth with the development of the railroad and motor-road net and the introduction of a variety of modern, mechanized manufacturing establishments.

El Mahalla el Kubra was long one of Egypt's main handloom cotton-weaving centers, but its growth into one of the largest cities of the country dates from 1927 when the Misr Company for Cotton Spinning and Weaving, one of the many activities of the Misr group, Egypt's largest financial and industrial organization, opened its first mill there (see Chapter 9, Manufacturing).

Tanta, the largest urban center of the delta proper,[17] owes its size to its location in the heart of the most productive agricultural section of the delta and its central position with respect to the delta as a whole. It is the crossroads for the main railroads and motor roads of the delta, and as the result has become a great commercial depot and industrial center.

As is the case with many cities in the Moslem world, the early growth of Tanta was due partly to its religious association. Sayed Ahmed el-Badawi, a native of Morocco and a noted thirteenth century exponent of Islam, settled there on his return from a pilgrimage to Mecca, and his tomb and mosque in the town still attract pilgrims by the hundreds from all over the delta, particularly during three annual festivals that last for weeks, with the usual accompaniment of elaborate fairs.

El Mansura, on the east bank of a broad curve of the Damietta Branch about 40 miles upstream from Damietta, is the main urban center of the northeastern part of the delta. Founded toward the end of the twelfth century, it was second only to Damietta as an eastern outpost of the country in medieval times, and consequently attracted Greek and Levantine merchants who in turn attracted large numbers of native craftsmen and artisans. Its present importance is due to its recent development as the cotton market of the northwestern delta section. Cotton ginning and cottonseed oil extraction are its principal industries.

El Zaqaziq, now the chief city in the eastern part of the delta, is one of the few cities in Egypt that has no ancient background. (When Napoleon's engineers made their survey of the delta in the late eighteenth century they found in the vicinity only mounds marking the site of an ancient city that dates back at least as far as the Fourth Dynasty and was called Bubastis by the Greeks.) El Zaqaziq was established about the middle of the nineteenth century solely as the result of the spread of cotton growing in the delta. It was built at the junction of canals dug to supply irrigation water for new cotton lands. The section rapidly developed into one of the most productive cotton areas of the delta and Zaqaziq became one of its leading cotton markets. European cotton buyers were attracted there and many large cotton-growing landlords made it their residence.

Further impetus to the growth of Zaqaziq was given in 1863, when the Ismailiya Freshwater Canal, which carries Nile water to the towns of the Suez Canal Zone, was constructed past it and again in 1868 with the completion through it of the main railroad connection between Cairo and the canal towns by way of Ismailiya. The Ismailiya Canal provides irrigation water for some 250,000 feddans of new land, now occupied by small farming families totalling nearly a quarter of a million persons, for whom Zaqaziq provides the principal marketing and purchasing center. What caravan traffic is still carried on between the delta and Sinai is also centered mainly at Zaqaziq. As a result the town has a mixture of urban and of village life with a flavor of nomadism to be found nowhere else in the delta. Zaqaziq's industry is a corresponding mixture of large cotton ginneries and mills and small craft shops catering to the needs of the local agricultural population.

The modern city of Damanhur, the cotton center of the western part of the delta and capital of Beheira province, about 40 miles southeast of Alexandria, resemble El Zaqaziq in origin and function, although it is more exclusively a cotton-marketing center. It is on the site of Timenhor (Town of Horns), a town of considerable importance in Ptolemaic times, on the Canobic

Branch of the Nile, once its westernmost branch but now long silted up. Timenhor fell into ruins shortly after the end of the Roman period, and the present town, with its cotton market and ginneries, was founded only in the mid-19th century after cotton growing had been introduced into that section of the delta.

Ancient Times in the Delta

The exhaustive archeological research that has brought to light so much of the history of ancient Egypt has been confined chiefly to the Nile valley. There the bordering limestone cliffs and the nearby supplies of granite, porphyry, and other hard rocks for ornament and sculpture provided the material for the monuments that have endured down to our own time. In the delta, on the other hand, if stone was to be used for construction it had to be brought down from the valley or from the scarcely less distant limestone cliffs west of Alexandria. Furthermore, the deep alluvium of the delta afforded no such solid foundation on which to build as did, for example, the rocky floor of the Theban area in the Qena Bend of the Nile, or the granite cliffs of Aswan, or the desert-edge site of the Great Pyramids. As a result, the few ancient stone structures that were built in the delta have been largely submerged as the rock foundation subsided under the increasing weight of alluvium.

Nevertheless, it is believed that civilization in Egypt first developed in the delta. There the Pharaohs of the First and Second Dynasties reigned in capitals at Saïs and Tanis,[18] and from there natives or invaders now and again challenged the authority of the Theban Pharaohs. Its great expanse of cultivable land, as compared with the narrow strip in the valley, made the delta both an attraction to foreign invaders and a base of resources which ambitious Egyptians could muster for the overthrow of the valley rulers. The extent of delta cultivation in Pharaonic times is not certain. The sites of ancient cities are known, however, at least within the present area generally under cultivation. Furthermore, even in the water-logged and largely abandoned land of the coastal belt, ruins of Ptolemaic and early Roman settlements and traces of canals and embankments indicate that much of the land was once under cultivation.

After the Arab conquest in the Seventh century A. D., the area of cultivated land in the delta continued to decrease, until, by the end of the eighteenth century, it covered no more than 60 per cent of the delta. The decline in production from the land still under cultivation was scarcely less serious. Although irrigation and drainage works in the delta were almost completely neglected throughout this period, the decline is to be attributed only in part to that. Most marked was the deterioration of the coastal belt and the eastern and western borders. Subsidence of the delta foundation had finally brought a broad coastal belt close to, and in places below, sea level and so lowered the central part of the delta that Nile water could reach only the central two branches (the Rosetta and Damietta) of the seven that formerly carried its water to all parts of the delta.

The Delta under Perennial Irrigation

Up to this time, the delta had been almost exclusively under basin irrigation. Only along the Nile branches in the southern part of the delta where water could be lifted even during the low-Nile months was there anything approaching perennial irrigation. As the eastern and western branches of the Nile were progressively abandoned, the area that received the annual flooding on which basin irrigation depends grew correspondingly smaller. The present agricultural prosperity of the delta must be ascribed to its conversion to perennial irrigation, beginning with Mohammed Ali's efforts, early in the nineteenth century, to provide summer water for cotton growing (see Chapter 5, Irrigation).

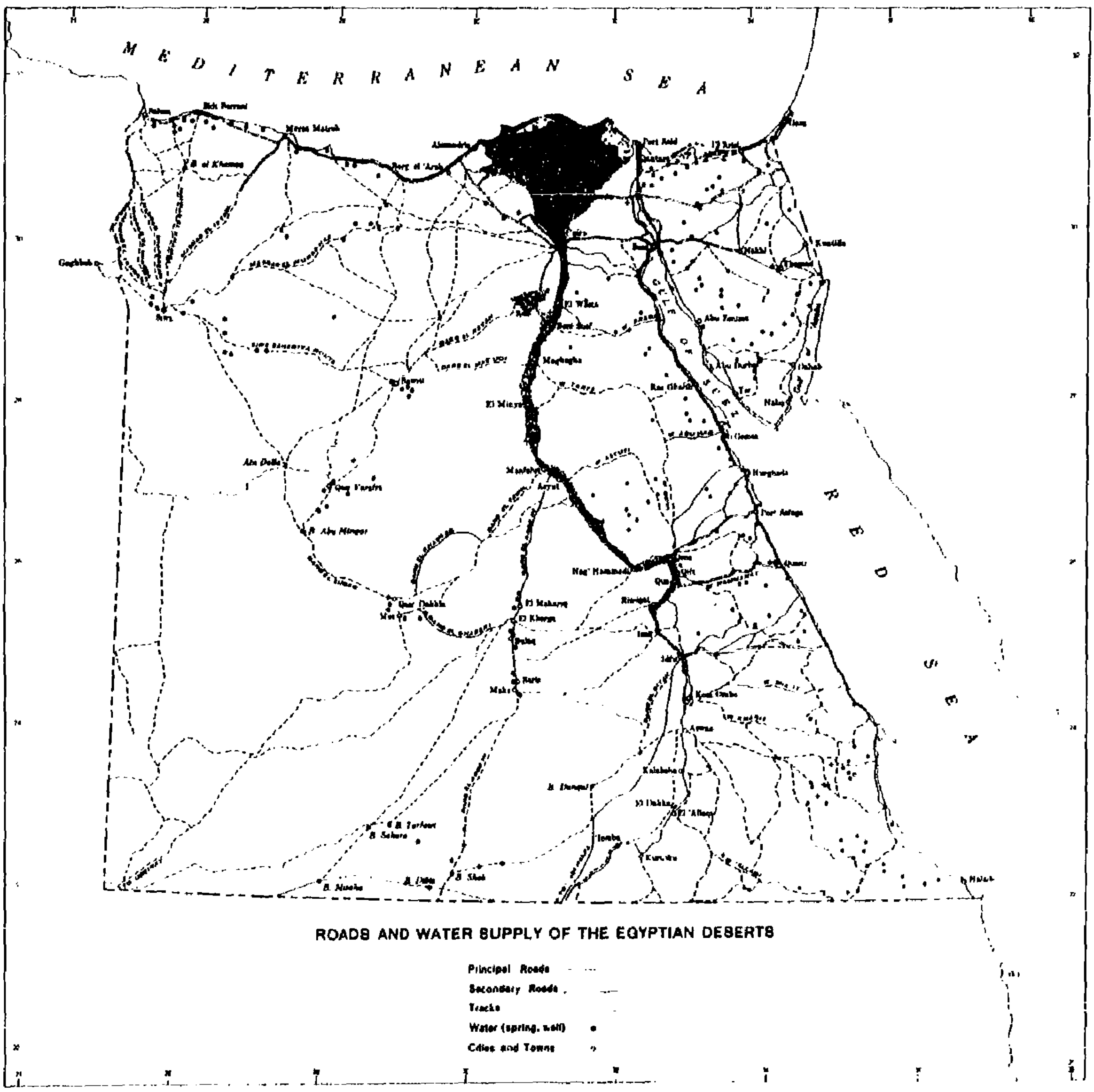
With the development of perennial irrigation the whole pattern of human habitation has been altered. Even at the height of previous periods of prosperity settlements were limited to a few natural elevations above the reach of the annual inundation and to the banks of the Nile branches. Perennial irrigation has been followed by a mushrooming of villages and towns throughout the delta area, and the silt cleared annually from the irrigation and drainage canals and piled on their banks provides an almost stone-like foundation for an elaborate network of roads and railroads.

Today 60 per cent of the cultivated Nile land is in the delta. On the average the productivity of its cultivated land surpasses that of the valley. The central and southern districts, however, are the richest of all. There is the most fertile land, the most adequate and dependable supply of irrigation water, and the best gradient for natural drainage. Outward in all directions from this core the maintenance of the soil at optimum productivly becomes progressively more difficult. Northward it is retarded by the lack of natural drainage and the consequent menace of ground water too near the surface or of soil salinity too high for any but the most tolerant crops. As one goes farther and farther eastward and westward from the Nile branches toward the desert edges, not only does the canal transport of irrigation water become more and more difficult but the soil becomes less fertile owing to the mixture of windblown sand with the alluvium and greater water requirements.

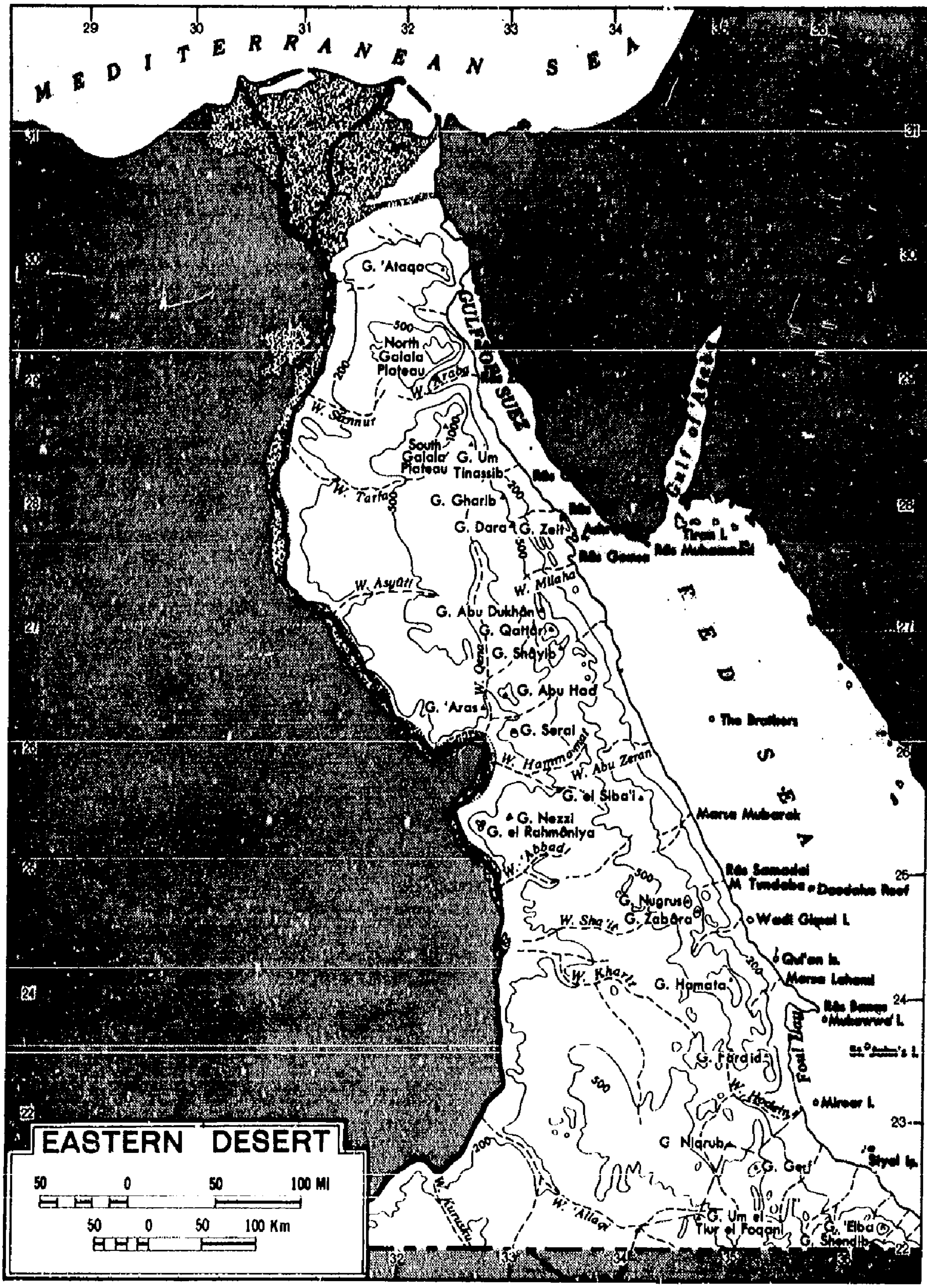
The southernmost part of the delta is still its most intensively cultivated section, as it has always been, but it is no longer necessary to lift water from the Nile branches to maintain year-round cropping. The agricultural communities of the southern delta most closely resemble those of the valley: there is the same excessive fractioning of the land, high density of population, and typical clusters of battered mud huts that have housed the Egyptian fellah since time immemorial.

THE EASTERN DESERT

The Eastern Desert, bounded on the west by the Nile valley and delta and on the east by the Red Sea, the Gulf of Suez, and the Isthmus of Suez, has an area of about 85,690 square miles (slightly more than the state of Utah) and covers about 22 per cent of Egypt. It consists essentially of (1) a broad



ROADS AND WATER SUPPLY OF THE EGYPTIAN DESERTS


MEDITERRANEAN SEA
G. 'Ataqa
North Galala Plateau
W. Araba
W. Sannur
GULF OF SUEZ
South Galala Plateau
G. Um Tinassib
W. Tarfa
G. Gharib
G. Dara
G. Zeit
Gulf of 'Aqaba
Tiran I.
W. Asyuti
W. Miliha
G. Abu Dukhan
G. Qattar
G. Shayib
W. Qena
G. Abu Had
G. 'Aras
The Brothers
G. Seral
W. Hammamat
W. Abu Zeran
G. el Siba'i
G. Nezzi
G. el Rahmaniya
Marsa Mubarak
W. 'Abbad
G. Nugrus
G. Zabara
W. Sha'it
Wadi Gimal I.
Qul'an Is.
W. Kharit
G. Hamata
Marsa Lahami
Foul Bay
G. Faraid
W. Hodein
Mirear I.
G. Niqrub
Siyal Is.
G. Geri
W. Kurkur
W. 'Allaqi
G. Um el Tiur el Foqani
G. 'Elba
G. Shendib
EASTERN DESERT
50 0 50 100 MI
50 0 50 100 Km

limestone plateau bordering the Nile valley northward from the vicinity of the Qena Bend; (2) a dissected sandstone plateau that fills the whole southern region between the Red Sea Mountains and the Nile valley south of the Qena Bend, and extend north of the Qena Bend in a narrow, much-eroded strip between the mountains and the limestone plateau; and (3) the backbone of ancient rocks that forms the Red Sea Mountains close to and nearly parallel with the Red Sea.

The Limestone Plateau

The limestone plateau country occupies about a third of the Eastern Desert. It consists mostly of Eocene series, the hardest of the limestone formations in Egypt, with Cretaceous exposures along its eastern and southern edges. Toward its southern end, east and south of the Qena Bend, it is broken into masses of hills, with the underlying Cretaceous shales and chalky limestones heavily sculptured into steep, gully-scored cliffs, capped by the harder Eocene formation. In places where the caps have been broken away the underlying Cretaceous has been eroded into peaks that resemble the Matterhorn.

Along the valley north of the Qena Bend, the limestone plateau rises above the Nile plain in bold cliffs to a general elevation of about 1600 feet. North of the Red Sea Mountains, it reaches heights of nearly 5000 feet in the intensely folded El Galala hills (South Galala, 4831 feet; North Galala, 4350). Between Cairo and Suez it breaks down into low, rolling hills that border the coastal plain.

The broad section bordering the Nile valley is a flat-topped plateau with a bare or pebble-strewn limestone surface. Characteristic of it and distinguishing it from the limestone of the Western Desert is its intensive dissection by deep, steep-sided wadis - stream-cut valleys now dry, except when rarely occurring rainstorms in the Red Sea Mountains convert one or more of them into temporary torrents. Characteristic of these wadis are dry waterfalls in the form of sharp ledges with depressions at their feet (which hold water for some time after rain and serve the nomads as water-holes), fills of boulders broken from their walls, natural bridges, and masses of tufa and travertine.

The wadis are a serious obstruction to free movement. A few trails known to the nomads follow the plateau top between them. The wadi drainage is mostly to the Nile valley, except in the northeast where they open to the Gulf of Suez. In either direction their breaks through the plateau front are in the form of a few trunk wadis with numerous tributaries. Where the trunk wadis break through the plateau front to the Nile valley their outlets are wide, deep bays in the bordering cliffs. Some of these trunk wadis contain small settlements, mainly of semi nomads. Sudden torrents always threaten to wipe them out, and may even carry their boulder-laden floods to engulf valley villages at the wadi mouths. But a man may live his life out in a wadi village without experiencing one such flood.

The Sandstone Plateau

The narrow strip of Nubian sandstone between the Red Sea Mountains and the limestone plateau is almost completely eroded away in the wide valley of the Wadi Qena, from about latitude 28° north to the latitude of the Qena Bend of the Nile, where the wadi turns westward to break through the limestone plateau to the Nile valley.

The broad section of the sandstone plateau, south of the limestone outliers in the vicinity of the Qena Bend, covers about a third of the Eastern Desert. Here the plateau as a whole slopes rather gently toward the Nile, from elevations averaging 1300 feet at the base of the Red Sea Mountains to an average of about 650 feet at the edge of the Nile valley. Although the sandstone here is harder than it is in the belt along the mountains where the Wadi Qena has eroded its wide valley, it is more easily eroded than is the limestone. Consequently, not only is it more broken up by wadis, but the wadis have cut deep ravines with steep walls 150 to 300 feet high that are completely devoid of ledges, rock steps, and boulders. Most of the drainage is toward the Nile through five great trunk wadis, of which the southernmost, the Wadi 'Allaqi, is 200 miles long. Only one trunk wadi of any importance, the Wadi Hodein, drains toward the Red Sea.

Because these sandstone wadis are free of the obstacles found in the wadis of the limestone plateau, many of them are used as regular travel routes, and movement in this section of the desert is consequently much freer than in the limestone plateau. A number of these wadis have been used in the past as through routes from the Nile to quarries and mines in the Red Sea Mountains.

The Red Sea Mountains

The Egyptian section of the Red Sea Mountains extends for nearly 550 miles along the Gulf of Suez and the Red Sea, from their north end where they abut on the limestone highlands of Galala to the Egypt-Sudan boundary, and occupies close to a third of the Eastern Desert. It is a region of great complexity, owing to the wide variety of rocks of which it is composed and the folding and faulting involved in its uplift; and a wilderness of ranges with a number of peaks rising to well over 6000 feet, of which the highest, the 7165-foot (2184-meter) Gebel el Shayek (the old man) is surpassed in elevation among the mountains of Egypt only by some of the highest peaks in southern Sinai.[19] The mountain region was thrown up coincidently with the formation of the great rift or trough-fault of the deep Red Sea and its shallow northward continuation in the Gulf of Suez, both of which it faces with bold escarpments.

North of about latitude 27° north, granites predominate, composing such bold and rugged ranges as the Qattar-Shayeb massif and a mountain wall, 3000 to 5000 feet high, which extends for about 90 miles between Gebel Shayeb and Gebel Gharib. South of latitude 27° the rocks consist mainly of schists and other metamorphic types. The resulting landscape is a relatively open one of lower hills, level tracts, and broad, smooth valleys. Such granites as there are appear only in isolated masses and ridges.[20]

In the northern section coarse and highly acid red granite is one of the main constituents and forms some of the most conspicuous mountains of the whole region - narrow, knife-edge ridges with sharp crests broken into pinnacle peaks, such as Abu Harba (spear in Arabic), Qattar, Shayeb, Faraid, Um Rasein, and Elba. Red granite also predominates wherever granite appears in the south, and hamra, Arabic for red, or adar, the Bishari word, is often included in the names of individual peaks there - Gebel Hamrat Wogud, Gebel Hamrat Mukbud, Adar 'Aweib, and Adar Qaqa. Large, dome-like masses and rounded hills, such as the Nugrus Mountains and the Um Disi Hills in the south, are also typical of the granite topography.

The diversity of the region is greatly augmented by dykes and veins of igneous rock and volcanic intrusions. A "dyke country" of sharply defined ridges and narrow mountain crests is well developed west of the Qattar-Shayeb massif. Ancient volcanic action determined some of the highest mountains of the whole Red Sea Mountains region as, for example, the 6552-foot (1997-meter) Gebel Hamata in the south, Gebel Kukhan in the central part, and the northern ranges near the Gulf of Suez.

Other details of the topography are due to the differential faulting and folding movements. Longitudinal wadis, such as the Wadi el Atrash on the west side of the Um Sidri-Dukhan massif, have developed along lines of faults running nearly due north and south; a number of wadis also owe their origin to transverse fissures; and a combination of faults running in the two directions have produced several square or rectangular mountain masses, of which the Qattar-Um Disi-Atalmi-Belih block at about latitude 27° north is the most notable example.

The northern portion of the region is particularly affected by secondary folds and faults which follow symmetrically the outline of the coast and are associated with the upthrust along the fault-trough of the Gulf of Suez. The beds were thrown up into a parallel series of incomplete synclines and anticlines in which the sandstones and limestones were brought into direct contact with the igneous rocks. The result is the elongated Esh-Mallaha-Dib range and the Zeit coastal range, which run parallel to the main body of the Red Sea Mountains, separated by longitudinal plains. These lower ranges are detached parts of the main igneous mass of the Red Sea Mountains. They are partly buried with Cretaceous and Tertiary sedimentaries under a subsequent, almost complete cover of Pleistocene gravels and alluviums.

The minerals in the igneous rocks of the Red Sea Mountains and the value of the rocks themselves for building and sculpture have attracted exploitation since the earliest times of which there is record (see Chapter 8, Raw Materials and Mining). The Romans were particularly active in these mountains during the nearly 300 years of their occupation. Their roads from the Nile valley can still be traced, and the sites of many of their mines and quarries are well known, the most famous being the well-preserved quarry settlement of Mons Claudianus. One road, by which quarried stone was brought to Qena for shipment down the Nile to Alexandria and thence to Italy, was nearly a hundred miles long. Sections of it and the

ruins of way stations along it are still visible. At the quarries, a temple, quarters for troops, the quarrymen's village, baths, wells, a long aqueduct, and blacksmith stalls with the remains of their charcoal heaps can all be identified. Hundreds of cut blocks of stone and many columns still await transport to the Nile. Much of the history of the place is revealed in numerous inscriptions. The columns for Hadrian's Forum as well as the stone for many other famous buildings were cut there.[22]

The Eastern Desert Coast

The Eastern Desert faces the Gulf of Suez and the Red Sea with a coastal plain which is narrowest at the northern end of the gulf, where it borders the limestone plateau. In places, indeed, the limestone foothills rise so abruptly from the sea that camels following the coastal track must wade around their spurs.

Where the plain borders the Red Sea Mountains it varies in width from 10 to 20 miles. South to Ras (Cape) Benas, latitude 24° north, it is developed on limestone and gypsum beds, mostly Miocene. From there on southward the limestone gives way to Nubian sandstone (see Appendix 1, Geology), much of which is buried by recent deposits of sand and coral. The numerous wadis that cut this section of the plain have their heads in the bordering mountains and consequently are mostly short. The occasional rainstorms in the mountains fill them with rushing torrents which carry little silt but choke the wadi mouths with rock fragments.

The Gulf of Suez occupies a shallow trough. Its greater depths are generally around 120 feet, but there is a sudden drop to a maximum depth of 270 feet near the Strait of Gubal, by which the gulf connects with the Red Sea. Small islands, outliers of the coastal Zeit range which borders the main mountain mass, form several groups at the south end of the gulf and along the west side of this 32-mile strait.

The put of the coastal plain submerged beneath the Red Sea is narrow, generally less than 700 feet wide. The descent from it to the sea floor is everywhere marked by an abrupt fault step, from which the drop down to the innermost trough of the sea, where depths exceed 6000 feet, is by similar well-defined steps.

In both the Gulfs of Suez and 'Aqaba and in the Red Sea, coral reefs have been built up in the shallow coastal waters, but they are much more common in the sea than in the gulfs. Developed on the submerged mountain base, they fringe the sea coast and lie in long reefs parallel to it. Since most of these reefs rise close to the surface, the sea breaks over them, and some emerge as islets, atolls, and barriers. A few breaks in these reefs (called marsa or mersa, plural marasi in Arabic) permit entrance for anchorage behind a sheltering cape. Barrier reefs also fringe the island groups at the south end of the Gulf of Suez. Farther out, where the Red Sea is deep, there are three groups of islands of coralline limestone built on volcanic bases - The Brothers, Daedalus Reef, and St. John's Island, from northwest to southeast.

Population of the Eastern Desert

The only figure for desert nomads in the 1947 census reports is an estimate of 55,073 for the nomadic population as a whole. There is no indication as to how this figure was arrived at, nor is an estimate available as to the distribution of the nomads in the three desert sections. However, in its numerous wadis and particularly in the eastward-facing and frequently mist-enveloped valleys of the Red Sea Mountains, the Eastern Desert has more water and pasture than does either of the other sections and consequently supports a larger population of pastoral nomads. Some caravans operate along the Red Sea coast and between the coast and the Nile valley, but by far the largest proportion of the Eastern Desert nomads are herders of sheep, goats, and camels. They carry on some trade in livestock at the edge of the Nile delta and by way of some of the larger trunk wadis in the valley, but the principal markets are the mining and petroleum camps and ports and the fishing settlements on the Red Sea coast.

The figure of 15,929 reported as the total for the permanently settled population of the Eastern Desert in the 1947 census was the smallest for any of the three desert sections; that for the Western Desert was 107,342 and for Sinai 37,670. The great majority of the permanent population in the Eastern Desert lives in four villages on the Red Sea coast - Guardaqa (population 4301 in the 1947 census), Quseir (5366), Ras Gharib (3799), and Safaga (about 3000).

Ghardaqa (which appears on many maps as Hurghada, a British transcription of its Arabic name) is the capital of the Red Sea Frontier District, but serves chiefly as the residence of the workers in the nearby petroleum fields and as the port from which the petroleum is shipped by tanker to the Suez refineries; this is also the chief function of Ras Gharib. In Pharaonic times ports at the present sites of Quseir and Safaga were transfer points from which cargoes, brought by ship from Arabia and the east African coast farther south, were transported by caravan to the towns of the Nile valley. Both ports are connected with Qena by a motorable road which was built for possible use during World War II in case the Axis powers should block Allied shipping through the Suez Canal. Except for a few fishermen, the present inhabitants of both these ports are there because of the nearby phosphate mines and activities connected with the shipment of phosphate from them; the roads are little used except by personnel of the phosphate mines and ports coming back and forth from the Nile valley.

The few settled inhabitants on the Gulf of Suez coast south of Suez live around springs and wells, as at Bir (well) Odeib and Ain (spring) Sukhna, a short distance south of Suez.

THE WESTERN DESERT

The Western Desert of Egypt forms the northeast corner of the great Libyan Desert. Extending from the Mediterranean Sea to the Sudan border between the Nile valley and delta and the boundary with Libya, it covers

two-thirds of the country. Its area of about 262,800 square miles (681,000 sq. km.) is nearly equal to that of the state of Texas.

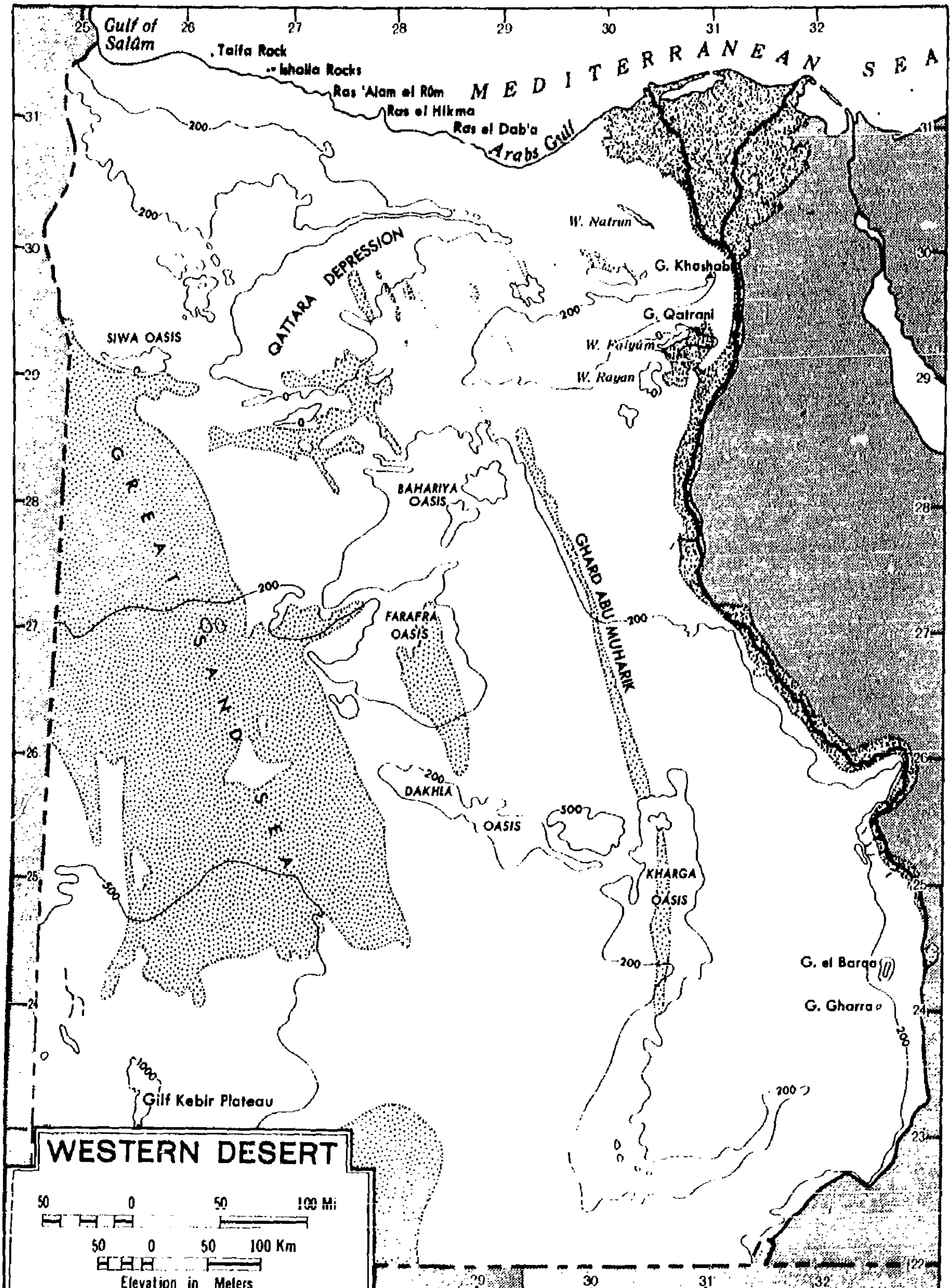
This desert is, for the most part, a massive plateau, composed to great depths of sedimentary strata that have been little disturbed since they were laid down - Nubian sandstone in the south, Cretaceous and Eocene limestone in the central part, and Miocene limestone and calcareous sandstone in the north. Nowhere is it more than 1500 feet high, except in the Gilf (scarp) Kebir (great), a tableland in the extreme southwest. The general level of Gilf Kebir is somewhat over 1650 feet, but it is crowned with a mesa of about the same height. The pronounced uniformity of the Western Desert is in distinct contrast with the Eastern Desert and Sinai, with their rugged mountains and limestone hills. Its surface consists of rocks, stones, and sand, some 10 per cent of it being covered with deep sand accumulations. Dunes in longitudinal ridges are distinctive features of the central part of the desert.

Unlike the Eastern Desert, too, the Western Desert has practically no wadis except in the southwest tableland, where they are soon lost in the bordering sand. Its erosion features are due to wind and windblown sand rather than to water; in recent times it has had the lowest rainfall in Egypt, and there is evidence that even during the rainy period of the remote past, when the Nile valley acquired its present form and the great wadis of the Eastern Desert and Sinai were cut (see Appendix 1, Geology), only a few water courses were established in the Western Desert.

The Depressions of the Western Desert

Unique features of the Western Desert are the widely scattered depressions, some of them thousands of square miles in area, in its central and northern parts. The descent to these depressions is in most places by steep walls, often with a drop of as much as three hundred feet from the bordering plateau surface. The northern depressions - Siwa (near the boundary with Libya), Qattara (in the center), Natrun (a short distance west of the delta), and Faiyum and Rayan (near the lower Nile valley) - are all below sea level and have brackish water or salt marsh, or both, in their bottoms. In the central desert artesian water supports considerable agricultural activity in the Bahariya, Farafra, Dakhla, and Kharga depressions. Of the northern depressions Siwa and Qattara also have artesian water, but only in Siwa is there cultivable land.[23]

The theory has been advanced that these depressions owe their origin to wind erosion of the softer strata after they had been exposed by folding and disintegrated by the great diurnal temperature variation.[24] W. F. Hume, long a member of the Geological Survey of Egypt and a leading authority on the geology of the Egyptian deserts, accepts this theory but adds that it "is necessary to recall that there must have been a vast primary marine denudation as the anticlinal areas now occupied by the depressions rose from beneath the sea." The superincumbent hard Eocene limestones had to be worn away before wind abrasion and wind transport could produce the depression.[25]



Gulf of Salûm
Taifa Rock
Ishaila Rocks
Ras 'Alam el Rûm
Ras el Hikma
Ras el Dab'a
Arabs Gulf
MEDITERRANEAN SEA
W. Natrun
G. Khashab
G. Qatrani
W. Faiyum
W. Rayan
QATTARA DEPRESSION
SIWA OASIS
GREAT SAND SEA
BAHARIYA OASIS
FARAFRA OASIS
GHARD ABU MUHARIK
DAKHLA OASIS
KHARGA OASIS
G. el Barqa
G. Gharra
Gilf Kebir Plateau
WESTERN DESERT
50 0 50 100 Mi
50 0 50 100 Km
Elevation in Meters

The Nubian Sandstone

The southern third of the Western Desert, mainly south of the 25th parallel, is a solid expanse of Nubian sandstone (see Appendix 1, Geology). Most of its surface is broken only by occasional small hillocks, where the ancient rock outcrops, or by small, flat-topped mesas and truncated pyramids, where the softer underlying strata have been worn away by wind-blown sand beneath caps of harder surface layers. The highest section, the Gilf Kebir tableland in the southwest corner, is about 150 miles long from north to south and has a maximum width of 50 miles. With its smaller mesa crest, it is all that remains of a former sandstone series that has elsewhere been worn down to a vast sand plain.[26]

Relatively hard silicified beds of dark sandstone and pebbles distinguish the Gilf Kebir from the surrounding plains, and in addition to its mesa, a few isolated low, rounded domes of intrusive basalt interrupt its otherwise level surface. Like the Eastern Desert and in contrast to the rest of the Western Desert, the Gilf Kebir shows the effects of the rainy Pleistocene; in the north it is cut by canyonlike wadis into a maze of flat-topped outliers and conical buttes.[27] Paleolithic and Neolithic implements and flake tools dating from before 4000 B. C. have been found in a number of places, and there are paintings and rock engravings of human beings and cattle in caves in the wadi sides.

Southwest of Gilf Kebir the plateau continues at a general elevation of around 2000 feet as far as the foothills of the rocky, 6215-foot (1895-meter) Mount 'Uweinat, just over the Sudan border, discovered in 1923 by an Egyptian expedition.[28] Occasional volcanic craters, basaltic domes, and low rounded hills of granite and gneiss rise a few hundred feet above the general level of the plateau, and at the southern border of Egypt the foothills of the isolated crystalline mass of 'Uweinat appear.

At the northern edge, where it begins to be overlain by limestone, the surface of the sandstone formation has been scooped out into two of the major depressions of the Western Desert - the oases of Kharga and Dakhla. The general porosity of the sandstone deposits and their foundation of impermeable igneous rock provide channels which conduct the spring and well water hundreds of miles from the rainy interior to the south and southwest. It is these channels that make the depressions of the Western Desert habitable.

The Limestone Country

In the middle of the Western Desert, mainly between the 25th and 29th parallels, but approaching the Nile valley between the 23rd and 30th parallels, the Nubian sandstone is overlain by two successive limestone series - the Upper Cretaceous and the Eocene. Of the two the Cretaceous beds are the softer, owing to their members of sand, clay, and shale, and consequently they have been so degraded by erosion that they merge with the sandstone without any conspicuous change in elevation. They form parts of the Kharga and Dakhla depressions and the floor of the Farafra depression

and they skirt the Bahariya depression on the north. Razor-edge and hummocky terrain and melon-shaped concretions are common features.

The hard Eocene limestone, on the other hand, forms a broad plateau that rises above the Cretaceous series with high escarpments. This plateau is the dominant feature between the Nile valley and the southern and central groups of depressions. Between the valley and the Kharga depression it exceeds 1300 feet, and at its edge along the valley between Aswan and Isna there are peaks reaching over 1650 feet in elevation. The plateau culminates west of Isna in a 1988-foot (606-meter) peak, the highest in the whole limestone region.

North of the Kharga and Dakhla depressions the Cretaceo-Eocene escarpment rises in places to 1850 feet above sea level, with cliffs 400 to 800 feet high. Similar escarpments overlook the Farafra depression from the west, the Bahariya from the east and south, and the Faiyum from the north. The Faiyum depression is entirely hollowed from soft members of the Eocene.

Northward from approximately the 27th parallel the Eocene plateau gradually declines toward the Qattara and Siwa depressions, where it passes under the Miocene formations. There it is dominantly of the Middle Eocene series and erosion of its relatively soft constituents of loam and sand have produced a lower plain. The change from limestone cliffs to undulating plains is visible along the Nile valley from near the latitude of Asyut north to the Faiyum depression. Northwest of the Faiyum and north of the Bahariya depression, the Eocene surface is overlain by hills of Oligocene gravel and sand.

In addition to the artesian water in the depression oases, there are a few springs and wells, fed by the meager rainfall, in the limestone itself. This is especially the case where the joints and fissures of certain soft limestone members of the Cretaceous are underlain by impermeable beds of clay. These wells and springs are a boon to the nomads, whose caravans ply between the oases and the Nile valley and who know from long experience where to look for them. The necessary rain, however, is so limited and of such sporadic occurrence that the spurs and wells are by no means dependable.[29]

The Miocene Plateau and Depressions

Miocene formations composed of beds of limestone and calcareous sandstone rich in marine fossils cover most of the Western Desert from about the 29th parallel of latitude to the Mediterranean. To the south, however, their lower series contain relatively soft beds of marly sandstone and sand, on which a sandy lowland has developed between approximately the 29th and 30th parallels. Much of the Western Desert is covered by sand from this lowland. The sand dune belt, mentioned above, extends southward from it in the direction of the prevailing wind.[30] In this lowland are the Qattara and Siwa depressions and a number of smaller ones whose development is probably due to underground solution of calcareous beds.

The Qattara depression, nearly 200 miles (320 km.) long, with a maximum width of 85 miles (136 km.), is by far the largest and deepest of the Western Desert depressions. Its lowest measured point is 439.5 feet (134 meters) below sea level. That it had so large an area below sea level - approximately 6950 square miles (18,000 sq. km., or little less than the size of New Jersey) - was unsuspected until a survey in 1926.[31] It is the only major depression of the Western Desert that is completely uninhabited. Its floor is largely occupied by salt marshes and lagoons maintained by underground water from the same sources that supply the wells and springs of the Western Desert oases.[32] As its northeastern edge is only about 35 miles from the coast at Alamein, there has been some talk of installing a hydroelectrical plant powered by water brought into the depression through tunnels from the Mediterranean.[33]

The Siwa depression near the Libyan border, which has an area of 309 square miles (800 sq. km.) below sea level, is the only lowland depression that is permanently inhabited.

North of the lowland, Miocene limestone maintains the Western Desert plateau at an average elevation of some 650 feet, but it terminates near the coast in a low scarp cut by short gullies. As in the past, the hard, impervious, nearly level surface of this plateau is an important factor in the economy of the coastal region. It is ideal for caravan trails and roads, most of which converge at the Siwa Oasis and connect there with trails to other oasis depressions. Because it is impervious and dips slightly toward the coast, it is an excellent conserver and carrier of what little rain falls on it. During the Roman occupation many cisterns were excavated at its northern edge, and the water supply from them made possible a prosperous colonization of the coastal plain, in contrast to its present sparse and largely seminomadic population. A few shallow wells, fed by underground basins in which rain water penetrating through joints and fissures has accumulated on underlying beds of clay, still exist between the coast west of the town of Mersa Matruh and the Siwa Oasis.

East of the Qattara depression, the Miocene lowland gives way to a hilly section of Oligocene sandstone, gravel, and silt, extending from north of the Bahariya depression to the southern edge of the Wadi el Natrun depression southwest of the Nile delta. From there on to the alluvial edge of the delta is a rolling plain of sand and gravel, broken only by the narrow Wadi el Natrun, of which the southeast corner is only about 20 miles from the delta. This depression is 35 miles long and reaches 75 feet below sea level at its greatest depth. In its bottom, with their normal surface about 25 feet below sea level, is a chain of small lakes. Deposits of natural soda (natron), a compound of sodium carbonate and sodium bicarbonate which forms around the shores and in the bottom of some of the lakes, have been dug there since early Pharaonic times and have long been the basis of an important soda and salt industry (see Chapter 8, Raw Materials and Mining).

The Western Desert Coast

Near the Libyan border the scarp of the Miocene plateau, which bounds the Mediterranean coastal plain of the Western Desert on the south, stands only six miles from the sea. From there eastward the plain gradually widens to about 35 miles toward its eastern end, where it extends to the edge of the northeast tip of the Qattara depression.

Small, rounded grains of white oölitic limestone of Pleistocene and Recent age, resting on a base of Miocene limestone, form the shore of this plain and extend under the sea. Also composed of this limestone is a series of low ridges parallel to the shore, which were developed as coastal dunes when the Mediterranean stood about 140 feet above its present level and have been cemented into a hard rock known as Mex limestone from quarries of that name west of Alexandria. The depressions between these ridges are filled with loams and clay and are in part occupied by salt lagoons and salt marshes. [34]

The shore is low, its calcareous cover of fine limestone grains a dazzling white against the blue of the Mediterranean. A few low capes break it into a series of smooth, shallow curves. Anchorage is available in a number of small inlets (mersa), but the coral reefs that stud the coastal shallows make the approach to most of them difficult. Mersa Matruh, 192 miles by land west of Alexandria, and Salum, near the Libyan border, are the only ports, and facilities at both are limited. The extension of the coastal plain beneath the sea is narrow; at the 'Arabs Gulf the 500-meter (1640-foot) contour is only 20 miles offshore; further west it is even closer.

The plain at present looks like a desert borderland, but it was once a region of flourishing farms and gardens, as witnessed by the ruins of farmsteads, by dried-up wells and abandoned cisterns in the limestone, and by elaborate systems of irrigation channels dating from the period of Roman occupation. Grain and grapes were the principal crops, and the Romans performed remarkable feats of engineering in accumulating and conserving the water supply. At present the winter rainfall, normally 5 to 6 inches and undependable owing to pronounced fluctuations from year to year, serves mainly to support the barley and wheat patches of the seminomads.

The sparse sedentary population depends for its water supply on wells dug down to levels where rain water accumulates beneath the floor of the depressions between the limestone ridges. The small settlements strung along the shore serve primarily as trading centers for the nomads who operate caravans between them and the desert oases.

In ancient times the coastal plain was the avenue of contact between the Nile delta and valley and the rest of North Africa. Caravans still transport some goods, but since the founding of Alexandria they have largely been replaced by coastwise shipping. When World War II broke out, the Egyptian government had completed a railroad along the coastal plain as far as Mersa Matruh, and the Allied forces extended it to Salum. This last section,

however, has now been abandoned.

Mersa Matruh, with a population of about 3000 in 1947, is the main town and the seat of government of the Western Desert Frontier Province.[35] In Ptolemaic and Roman times it was an important port serving a hinterland extending to the Siwa Oasis, and it is still the terminus of the main road to this oasis. A beach of powdered white sand on its small bay is considered one of the most beautiful in the world. An exclusive summer resort is being developed there by Greek residents of the delta and valley cities. Nearby are the ruins of one of Cleopatra's summer villas, with stone steps down to the sea.

Recently this coastal region has been the object on considerable study in an effort to develop a sound pastoral economy. American experts have cooperated with the government in the introduction of pastoral grasses that can make the best possible use of the scanty rainfall and in developing means of water conservation. The government has also taken steps to prohibit the pasturing of goats, which has probably done more than anything else to destroy the native grasses.

Population of the Western Desert

The reports of the 1947 census give no figures on the distribution of the 55,073 nomads estimated for all of desert Egypt. All that can be said is that there are fewer nomads in the Western Desert than in either of the two other desert sections, owing to a greater scarcity of pasture and water for flocks in the former. Outside the oasis depressions the only significant pasture land is on the Mediterranean coastal plain. Only there and along the northern border of the adjacent limestone plateau is water available in sufficient supply for even a limited pastoral economy. But these desert people are seminomads, not true nomads, inasmuch as they eke out a living from their flocks and their caravan operations with patchy cultivation of grain in the coastal depressions.

In contrast with the very limited caravan transport still carried on in the Eastern Desert and Sinai, caravan trade between the oasis depressions on the one hand, and the Nile valley and the trading ports of the Mediterranean coast, on the other, is by far the principal occupation of the nomads of the Western Desert. They are most active between the Kharga and Dakhla oases and the valley towns, but all of the oases are connected by regular caravan routes, and a considerable amount of their trade is with the coastal ports by way of the Siwa Oasis.

The Settled Population.

Of the population of the Egyptian deserts rated as permanently settled in the 1947 census, 67 per cent was in the Western Desert, distributed as follows:

Table 1 - Settled Population of the Western Desert, 1947

Location	Population
Dakhla Oasis	21,382
Kharga Oasis	11,121
Bahariya Oasis	6,678
Siwa Oasis	3,768
Farafra Oasis	749
Coastal plain including Wadi el Natrun	63,644
TOTAL	107,342

In the oases, where all but an insignificant amount of the agricultural activity of the Western Desert is concentrated, an estimated total of about 36,000 acres are under cultivation. This is a little less than eight-tenths of an acre per capita as compared to a little less than five-tenths of an acre in the Nile valley and delta and Suez Canal Zone taken as a whole. In general, however, water for irrigation in these oases, derived as it is entirely from springs and wells, is by no means either as abundant or as dependable as it is in the Nile valley and delta. In general, too, the oasis farmers lack, or at any rate do not practice, the skill of the valley and delta farmers in using the water allotted to them. It must be said, however, that they have not had the aid and advice of irrigation and crop experts, to which the present fruitfulness of the Nile land is largely to be credited.

There is ample evidence that in all of these oases the area now under cultivation is far smaller and far less productive than it has been at various times in the past.[36] Ruins of temples and other structures of Pharaonic, Ptolemaic, and Roman times, especially in Kharga, Bahariya, and Siwa, attest to the one-time importance of these oases. Siwa was particularly famous as the seat of the Oracle of Jupiter Ammon, whom Alexander the Great consulted.[37]

During Pharaonic times the oases were an integral part of the Egyptian realm, the oases dwellers carrying on an active trade with the Nile valley and paying tribute to the Pharaohs. But their greatest prosperity appears to have been during the Roman period. Intent on developing Egypt as the granary of their empire, the Romans strove to make the fullest possible use of the water available, as witnessed by the remains of Roman wells, tunnels, and aqueducts. In the Bahariya Oasis tunnels have been found a hundred feet underground.

Since the end of the Roman period, oasis agriculture has deteriorated progressively as water use has devolved from community to individual control. Wells are constantly decreasing in flow or completely drying up, partly because of a lack of planning in the sinking of new wells so as to prevent their depleting the supply of those they are intended to supplement.

Nevertheless, as we have seen, there is considerable trade between all the oases and the Nile valley and delta and the ports on the Mediterranean coast. Products from Kharga and Dakhla go mainly to the valley, those from Bahariya to both the valley and delta, and those from Siwa to the coast. Only Kharga has a railroad connection - a 121 mile, narrow-gauge line which connects with the main valley line a few miles north of Nag' Hammadi. The others must depend on caravan transport. Dates, citrus fruits, and herbs are the principal products shipped out, although there is also some trade in date preserves, olive oil, pickled olives, and in palm fiber mats, sandals, camel saddles, pottery, and other traditional handicraft products. Kharga dates, which are considered among the best in the world, find a ready market in the valley and delta towns.

In the oasis villages the houses - mud houses much like those in the Nile valley village, but frequently of two stories - are commonly built one above the other on mounds, or against the sides of the depression, and are surrounded by mud walls put up in the past for protection against marauding nomads. Mud minarets tower above them. In Dakhla, the most populous of the oases, El Qasr, the chief village, has a population of about 3500, and there are four others varying in population from 1500 to nearly 3000. Kharga, too, has a number of villages, but the only settlement of any consequence is the town of the same name, with a population of nearly 7000. Kharga is the largest of the oasis towns and the seat of government of the Southern Desert Frontier District. Its chief importance, however, is as the transfer point for caravan cargoes from the other oases to the railroad that links Kharga with the Nile valley. [38]

On the Mediterranean coastal strip the population, except for the seminomads mentioned above, lives mainly in villages and hamlets along the shore and in the settlement of nearly 5000 employees of the soda and salt works in the Wadi el Natrun. Of the smaller settlements a number are fishermen's hamlets. The larger towns - Mersa Matruh (population about 3000), Sidi Barrani (3300), El Daba (3200), El Hamman (5500), Burg el Arab (1200), and Salum (1000) - are old settlements established by the ancient Greeks as entrepôts for caravan trade with the inland oases. This trade is still the principal raison d'etre of these towns, and the descendants of the early traders still figure largely in their populations.

THE PENINSULA OF SINAI

The actual Peninsula of Sinai is the triangular tract between the Gulfs of Suez and 'Aqaba, but the term is commonly applied to all the administrative subdivision designated as the Frontier Province of Sinai, which includes the region extending north from the true peninsula to the Mediterranean Sea between the Suez Canal Zone and the Egypt-Israel boundary. With an area of

about 22,500 square miles (59,570 sq. km.). it is, as thus defined, a little smaller than the state of West Virginia and covers nearly 6 per cent of the land surface of Egypt. Connected with it on the east beyond the old Egypt-Palestine boundary is the coastal "Gaza Strip," an area of about 135 square miles assigned to the Arabs by the United Nations in the 1947 partition of Palestine and occupied by Egypt in 1948.

Geologically and physically Sinai is one of two sections into which the Eastern Desert is divided by the Gulf of Suez and the Isthmus of Suez lowland. Its southern third is a mountain mass, essentially a detached block of the Red Sea Mountains. On the north this mass is flanked by an extensive central limestone highland, which slopes down gently northward to a bordering hill belt separating it from the wide Mediterranean coastal plain. Except for broad tracts of sand dunes near the Mediterranean, this plain is an open country broken only by isolated hills.

Like the Eastern Desert, Sinai is dissected by many wadis. Deep, canyonlike ravines drain east and west from the southern mountain triangle to the bordering gulfs. The east and west flanks of the central highland also drain to these gulfs, but the greater part of the central highland drainage is tributary to the trunk Wadi el 'Arish, which opens to the Mediterranean about thirty miles west of the Egypt-Israel boundary.

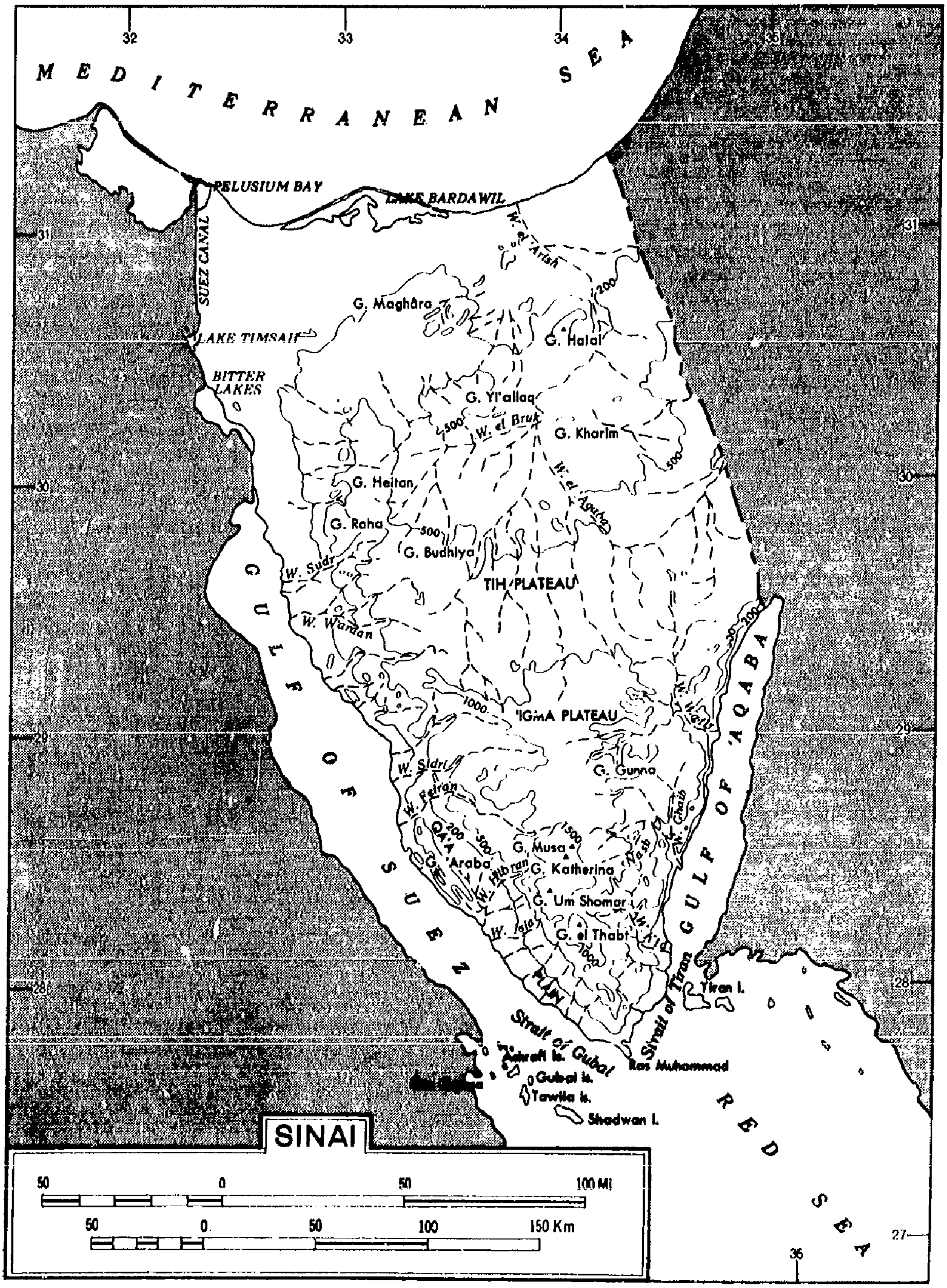
Rainfall and Water Sources

The Sinai Mountains and the central highland receive more rain than any other part of Egypt. The annual total is too small, however, to support any extensive agriculture, especially since most of it falls in sudden downpours. It is sufficient, however, to maintain many springs and wells and a few small perennial streams, which support natural growths of palms and tamarisks and occasional plantings of date palms on the coastal plains bordering the mountain triangle and on the limestone tableland. The mountains bear a sporadic growth of scrub and grasses that suffices to feed a considerable wild life - sand grouse, partridge, snipe, quail, hares, gazelles, ibex - and to provide pasture for the nomads' camels and small flocks of sheep and goats.

Near the Mediterranean coast underground water is tapped in wells at the foot of sand accumulations and in basins between the dunes. Palm-grove settlements cluster around a number of these wells between the town of 'Arish (near the mouth of the wadi of that name) and the Suez Canal. Incorporated in many settlement names are the Arabic generic terms bir (well) and hod (basin). These terms and ain (spring), galt (rock cistern), and temila (spots where water is to be found at shallow depths in sand or gravel) appear also in the names of well-known water locations in the mountains and tableland.

The Sinai Mountains

The Sinai Mountains are a rugged, complex massif, primarily crystalline and schistose rocks which rise in tilted steps to elevations of over 8000 feet. Deep, winding ravines separate the maze of peaks and sharp ridges.


MEDITERRANEAN SEA
PELUSIUM BAY
LAKE BARDAWIL
SUEZ CANAL
LAKE TIMSAH
BITTER LAKES
W. el 'Arish
G. Maghâra
G. Halal
G. Yi'allaq
W. el Bruk
G. Kharim
G. Heitan
G. Raha
G. Budhiya
W. Sudr
TIH PLATEAU
W. Wardan
W. el Aqaba
'IGMA PLATEAU
G. Gunna
W. Sidri
W. Feiran
QA'A
G. 'Araba
G. Musa
G. Katherina
G. Um Shomar
G. el Thabt
PLAIN
Strait of Gubal
Strait of Tiran
Ras Muhammad
Tiran I.
Ashrafi Is.
Gubal Is.
Tawila Is.
Shadwan I.
GULF OF SUEZ
GULF OF 'AQABA
RED SEA
SINAI
50 0 50 100 Mi
50 0 50 100 150 Km

Dyke intrusions, such as the bold granite ridges cutting through gneiss on Gebel (Mountains) Katherina and Gebel Serbal, and ridges of dolerite and red felsite in the southeast add to the complexity. Ancient volcanic materials, usually on a granite base, account for a number of the major ridges.

Evidence of pronounced crustal disturbance is widespread. On the east side the massif terminates in a precipitous structural escarpment which is everywhere close to the Gulf of 'Aqaba shore and in many places plunges beneath its surface. On the west side, still greater dislocations have produced the Qa' depression at the foot of the massif and the lower coastal ranges.[39]

In general, however, the northern part of the massif stands in marked contrast to the southern part. In the south, where the former sandstone cover (see Appendix 1, Geology) was removed only in relatively recent times, much of the original plateau surface is retained, whereas in the south a multitude of ranges tower above the valleys. The loftiest mountains of the massif are toward the west side of this southern section. The dark schistose Gebel Katherina is Egypt's highest mountain. The 8649-foot (2637-meter) Zebir, central and highest of its three clustered peaks, is known in legend as "the mountain on which God spoke to Moses."

Around Gebel Katherina are many other high peaks, a number of them well over 8000 feet. Most celebrated is the 7496-foot (2285-meter) Gebel Musa (Mountain of Moses), about three miles north-northeast of Katherina. It overlooks the spacious plain of El Rahab, where legend has it that Moses proclaimed the Law, and some think it may be the Mt. Sinai of the Bible. Standing side by side on Musa's summit are a Greek Orthodox chapel and a Moslem mosque, both built of blocks of local red granite. At its northern foot, facing the El Rahab plain, is the famous fortress monastery of St. Katherine, founded by the Emperor Justinian in 530 A.D. and still occupied by Greek Orthodox monks.[40]

There is much evidence of torrent action in the deep gorges of the wadis, in the valley oases, and in the numerous detrital terraces in the wider valleys throughout the region. Small streams flow perennially in some of the wadis, watering an occasional flourishing grove of palm and tamarisk, as in the wadis Feiran, Hebran, Thebt, and Letih on the west side, and Nasb and Kyd on the east. The Wadi Feiran is noted for its date palm oases, particularly one owned by the Monastery of St. Katherine and managed by a resident monk. The sale of dates from this oasis in the Suez markets contributes substantially to the support of the monastery. At the monastery itself water is channeled from perennial streams and springs on the slopes of Gebel Musa to irrigate gardens and orchards and groves of cypress and poplar.

The Central Highland

The central highland of Sinai consists of two distinct limestone formations. The lower of these, whose surface forms the vast El Tih plateau, is made up of relatively soft Cretaceous deposits, and the upper, which forms the smaller 'Egma plateau, is composed mainly of hard, snow-white nummilitic

Eocene beds. The two formations are clearly separated by soft, dark, shaley strata. Both plateaus are highest at their southern extremities, whence their strata dip gently northward. [41]

El Tih is shaped like a horseshoe opening to the north, where its two heels enclose an extensive low lying chalk plain. Wadis from the surrounding uplands cut through this plain in shallow, winding courses to join the El 'Arish trunk wadi which opens down its center. On the Wadi el 'Arish, near the southern edge of the chalk plain, lies El Nakhl, a post of the Frontier District mounted police, with a small village, the only settlement of any account in the whole limestone region. Between this plain and the coastal sand plain a series of asymmetric limestone anticlines from separate, abruptly rising, elongated, dome-shaped hills, of which the highest are between 2500 and 3500 feet. [42]

On its west, south, and southeast sides the El Tih horseshoe is faced by bold escarpments. For some sixty miles from its northern end the western escarpment is deeply cut by wadis, in all of which there is a good supply of water in springs and wells. In the courses of the larger coastal lowland wadis, a number of oases support plantings of date palms, much appreciated in the nearby towns of the Suez Canal Zone.

For nearly a hundred miles further south, the escarpment of Eitil, an unbroken wall of cliffs, rises at average elevations of 4000 to 5000 feet. The escarpment reaches 5300 feet at its extreme southern tip, where it overlooks a belt of lower country separating the tableland from the Sinai Mountains. From there on, the plateau curves around northeast, behind the ranges that frame the Gulf of 'Aqaba on the west, almost to the head of the gulf. On this side the plateau edge loses much of its escarpment character, but broken as it is by the narrow, tortuous gorges of the many wadis which cut through the bordering crystalline ranges, it is more difficult of ascent and descent than any other section of the plateau front.

'Egma, the upper plateau, is a crescent-shaped block crowning the southern part of El Tih and, like it, tilts slightly northward. It also is bounded on the west, south, and east by a steep escarpment, a seventy-mile stretch of 1000-foot white chalk cliffs. Its highest peak is the 5338-foot (1627-meter) Gebel Geneina near its southern edge. [43] To the north the plateau slopes down to merge with the lower levels of El Tih, and its surface is grooved with numerous wadis tributary to the Wadi el 'Arish. Many of these have cut narrow trenches deep down into the soft Cretaceous chalks and marls of El Tih, producing characteristic "badlands" topography.

What little rain 'Egma receives falls mostly in the south, where most of it percolates down to seep along the northward dipping strata and reappears in a few springs and shallow wells far to the north. Elsewhere, water is to be had only in an occasional rock cistern and at a few spots, known to the nomads, where it can be reached by shallow digging.

The Mediterranean Coastal Plain

Between the Mediterranean and the dome-shaped hills that border the central highlands on the north lies a broad plain, in most sections thirty-five miles or more wide, characterized by expansive accumulations of sand. Parallel ridges of sand dunes, running commonly in the northwest-southeast direction of the prevailing wind and rising to heights of 400 to 600 feet, are a striking feature of this plain. Along the coast many of these dunes are so encrusted with windborne salt as to be stationary, while those farther inland are constantly shifting.

The lower course of the Wadi el 'Arish breaks through this sand belt to the sea in a channel two to three miles wide, but drifting sand encroaches from either side. Although the wadi rarely carries water to the sea, water is generally to be had in a few wells dug in its bed. El 'Arish, a town of about 11,000 population on its west side and a mile and a half from the sea, is the administrative center of the Sinai Frontier District.

The coast is flat and smooth and dips so gradually under the sea that the 200-meter (656-foot) bathymetric contour lies 30 to 50 miles from the shore. Its major feature is the Sabkhet (salt lagoon) el Bardawil. This lagoon extends for 60 miles along the middle section of the coastal flats behind a narrow sand bar and has a maximum width of 13 miles. Marsh-bound and buried ruins of ancient settlements around it indicate fairly recent subsidence. West of the lagoon is the broad, shallow, open Bay of Tina, or Pelusium. Marshy mud flats now extend inland for nearly 25 miles, but it was into this bay that an easterly distributary of the Nile, the Pelusiac Branch, once emptied. Pelusium, a city at its mouth, was an important entrepôt of east-west trade until it was eclipsed by Alexandria. All that is left of it is two mounds on the edge of the desert about 20 miles southeast of Port Sa'id.

The Gulf of Suez Coast

The 192-mile (307-kilometer) Gulf of Suez coastal plain of Sinai varies in width from a narrow central strip hemmed in by the coast range to broad belts 15 to 20 miles wide at the northern and southern ends.

In the north, between the escarpment of the central limestone highlands and the gulf, the plain is undulating and sandy, broken by wadis that have cut through the escarpment from the El Tih plateau. In most of these wadis springs and wells yield good supplies of water, although much of it is brackish; in the larger wadis, as well as around springs outside them, there is considerable natural vegetation with some plantings of date palms. At Aiyun Musa (Spring of Moses), a few miles south of the El Shott quarantine station at the head of the gulf opposite Port Taufiq, there are a number of date gardens owned by residents of Suez.

The gulf coast is bordered for 20 miles from the Wadi Feiran south, almost as far as the village of Tor, by a coast range consisting of two parallel ridges, the western-most of which faces the shore with abrupt cliffs of red granite.

Wadi Feiran, which has its sources far in the interior of the northern part of the Sinai Mountains and is noted for its date gardens, is the largest wadi in this section of the coast. Between the coast range and the Sinai Mountains is the northern end of the low, sandy plain of Qa'. Averaging 15 to 20 miles wide, this plain extends 80 miles to Ras (cape) Mohammad at the tip of the peninsula. South of Tor it forms the coastal plain.

Along the Gulf of Suez coast a number of small capes afford some shelter for vessels at anchor. The harbor at Abu Zenima, about 70 miles south of Suez, where the British company which operates the nearby Um Bogma manganese mines (see Chapter 8, Raw Materials and Mining) has its port and headquarters, is considered the best on either side of the gulf. Coral reefs are, however, more in evidence here than on the opposite side of the gulf. The narrow promontory Ras Mohammad, composed of coral limestone, ends in an abrupt cliff that rises 90 feet above the sea.

The Gulf of 'Aqaba Coast

All along the Gulf of 'Aqaba - nearly 110 miles (176 kilometers) - the Sinai Mountains present a precipitous wall, leaving nowhere more than a narrow passageway and in places none at all. Only three wadis of any size break through the mountain barrier to this coast - Chowi, Watir, and Dahab, from north to south. The scarcity of fresh water and of inlets for anchorage, and the generally rough sea under the prevailing northerly winds add to the desolateness of the region.

The People of Sinai

The 1947 census of Egypt reported the population of the Frontier District of Sinai as 37,670. Of the sedentary inhabitants the great majority live in El 'Arish (population 10,791 in 1947), the administrative center, in and around Qantara Sharq (East) on the east side of the Suez Canal (population 13,384 in 1947), and in El Shott, the village and quarantine station at the head of the Gulf of Suez (population 660 in 1947). The only other settled populations are about 400 persons at Tor on the Gulf of Suez, long the quarantine station for Egyptian pilgrims returning from Mecca; an equal number at Taba, a police station and village at the head of the Gulf of 'Aqaba; around 100 at the police station of El Nakhl on the northern border of the central highland; and a few hundred in palm-grove settlements and fishermen's hamlets along the Mediterranean.

The remainder are Arab nomads, except for a small group in the Sinai Mountains known as Gebelia, who are descendants of Christian slaves from Egypt and around the Black Sea sent in by the Emperor Justinian as servants to the monks at St. Katherine's and other monasteries. Their ancestors turned Moslem centuries ago, and they are now indistinguishable from the Arabs in their way of life. The nomads live mainly in the central highland, in the bordering lowlands on the east and west, and in the Sinai Mountains, where better pasturage and watering places are to be found than on the barren and generally waterless northern coastal plain.

DESERT VEGETATION

In the northern part of the Western Desert, south of the coastal zone of winter rains, salt-marsh vegetation is characteristic of the floors of some of the larger depressions, such as Qattara and El Natrun. Elsewhere in the Western Desert natural vegetation is limited to the oases and smaller low spots where artesian water rises to, or close to, the surface. But over wide areas this desert has no plant growth at any time.

In the Eastern Desert, on the other hand, shrubs and trees are to be found in many of the wadis. Rainstorms, though only sporadic and of short duration, are characteristically torrential, and provide both moisture and washed-down soil. Such vegetation is especially abundant in the Red Sea Mountains, particularly in the Elba Mountain district. Mosses and lichens are fairly common on the moister eastern (seaward) slopes of these mountains.

In Sinai vegetation is much more abundant than in the Eastern Desert, owing to Sinai's greater altitudes and heavier precipitation. The wadis of southern Sinai are noted for their luxuriant stands of palms and acacias and heavy growths of rushes.

In both the Red Sea Mountains and Sinai these growths are so striking in the midst of the otherwise barren landscape that numerous wadis, wells, mines, and other natural and man-made features bear the name of a conspicuous species of the locality. Maps of Egypt carry many such names as Tarfa (Tamarisk), Gurdi (Ochradenus baccatus), Had (Fagonia arabica), Seyal (Acacia tortilis), Shih (Artemisia judaica), Markh (Leptadenia pyrotechnica), Kharit (Salsola foetida), and Samyuk (Ficus pseudosycomorus).[44]

Phytogeographical studies have revealed the existence there of more than 1800 plant species in the Egyptian deserts.[45] This flora is characterized by the prevalence of spinose trees, thorny shrubs, small succulent bushes, aromatic herbs, and small creeping plants.

Some of the species are to be found throughout the deserts wherever there is sufficient moisture, but many of them are confined to particular localities. Most of them have their best growth in spring and early summer, but a goodly number bloom in winter. Sparse though it is, this desert vegetation is of great importance in the livelihood of the desert nomads. It provides grazing or browsing for their animals, fuel, edible fruits, and medicinal plants. Medicinal plants from the Eastern Desert and Sinai, in particular, are not only used by the nomads but are to be found in the local markets. Important amoung them are thyme (Thymus capitatus), wormwood of the laxiflora variety (Artemisia herba-alba), and the Ben-oil tree (Moringa aptera) in Sinai; and halfa barr (Cymbopogon proxima), handal (Citrullus calocynthis), heglig (Balanites aegyptica), and shubruq (Convolvulus hystrix) in the Eastern Desert.[46]

THE ISTHMUS OF SUEZ

Landscapes

Between the desert plains of northwest Sinai and those bordering the Nile delta on the east lies the Isthmus of Suez lowland, through which the Suez Canal has been cut. At its narrowest point the isthmus is a little over 70 miles wide. Nowhere in the 90 miles between the Mediterranean Sea and the Gulf of Suez is the route followed by the canal more than 40 or 50 feet above sea level, except where it is crossed by scattered dunes and sandhills.

For about 28 miles from Port Sa'id to the town of El Qantara, [47] the canal traverses low, marshy plains, which occupy part of the somewhat subsided delta built by two ancient branches of the Nile. (These courses have been so long filled by desert sand that they can only be traced with difficulty.) The northern end of these plains is linked with the present Nile delta by way of the shallow coastal Lake Manzala. Port Sa'id stands partly on the narrow strip of land between this lake and the sea and partly on land made by draining the eastern end of the lake and building it up with earth excavated from the canal. An undulating terrain of sand and scrub with some flat tracts of gypsum - the floors of extinct shallow lakes - covers the stretch from El Qantara southward for 20 miles to the northern end of Lake Timsah.

The course of the canal in the central third of the isthmus is mainly through three lakes - Timsah and the Great and Little Bitter Lakes, from north to south. [48] Between Lake Timsah and Great Bitter Lake are eight miles of lowland 30 to 40 feet above the sea. Great Bitter Lake, 14 miles long and 8.5 wide at its maximum width, is an impressive body of water in its desert surroundings. Little Bitter Lake and the Strait of Kabrit, which connects it with Great Bitter, add another nine-mile stretch of water. When the canal was built both lakes were nearly dry, but they filled to their present level within a few months after the preliminary excavations began to bring Mediterranean water into them. The greatest depths in the filled Lake Timsah are, however, only between 18 and 22 feet, and Little Bitter Lake is nowhere much more than 17 feet deep. Consequently the canal had to be dredged through these lakes and the Strait of Kabrit. In Great Bitter the canal route has a minimum depth of 42 feet, and dredging was necessary only at its ends.

Between the east side of the Bitter Lakes and the foothills of the central highlands of Sinai a gravel plain rises gradually to a broad stretch of sand and scattered dunes. Groups of these dunes make rather striking features of the landscape; among the highest are Katheeb (dune) el Habashi (419 feet), six miles east of Great Bitter, and Gebel Sharfa (606 feet), seven miles east of Little Bitter. West of the lakes is a rather narrow, rolling plain of drift sand. Gebel Shubrawit (731 feet) and Gebel Gineifa (866 feet), in the foothills of the limestone plateau of the Eastern Desert, are only four miles from Great Bitter.

From Little Bitter Lake to the head of the Gulf of Suez the isthmus lowland is bordered by the limestone plateaus of Sinai and the Eastern Desert.

The gently rising sand plain continues between the canal and the limestone central highland of Sinai. Wadis cut by torrents in the highland lose themselves in it. West of the canal a stony plain strewn with dark gravel slopes up over a twelve-mile stretch to the foot of a steep escarpment crowned by Gebel 'Ataqa (2770 feet).

Marshland extends inland for four miles from the head of the Gulf of Suez. The canal runs along its eastern edge to the east side of Suez Bay, with Port Taufiq on the east side of its entrance and Port Ibrahim on an island on the west side. The city of Suez lies back of mudflats on the west side of the head of the bay; it is connected by road and rail with Port Ibrahim and the canal over a stone causeway.

The Isthmus Population

When the digging of the Suez Canal was begun in 1859 the isthmus was a desert inhabited by nomads and a settled population of a few hundreds concentrated around Suez, then a squalid native village, and in some clusters of huts well provided with water to irrigate a date palm or two and a bit of garden. That its population was reported as 373,176 in the 1947 census of Egypt must be credited in the first instance to the operation of the Suez Canal and to the fact that Nile water has been brought in by the Ismailiya Canal for household and industrial use and for irrigation throughout the full length of the Canal Zone.

Of the three Canal Zone cities, two - Port Sa'id and Ismailiya - owe their origin entirely to the construction of the canal and their growth to its operation. Suez owes much of its development, also, to its position at the Gulf of Suez entrance to the canal, although the rail connection with Cairo, completed in 1856, and the location at Suez of Egypt's only refineries for processing petroleum from the Egyptian wells along the Red Sea coast have also contributed to its growth.[49]

Socially and economically the people of the Canal Zone are among the most advanced, if not the most advanced, of any group in cities of similar size in Egypt. Thirteen per cent of them are bank depositors, as compared to only four per cent for Egyptians as a whole. Owing to the support provided for schools by the Canal Company, the proportion of illiterates is only about half what it is in the rest of the country. Medical care and hospitals made available by the company have helped bring the death rate below that of any other section of Egypt.[50]

NOTES

1. The average height of the Nile flood at Aswan is 302 feet (92 meters).

2. K. S. Sandford and W. J. Arkell: Paleolithic Man and the Nile Valley in Nubia and Middle Egypt, _in_ Prehistoric Survey of Egypt and Western Asia, The University of Chicago Oriental Institute Publications, Vol. 2, 1933, pp. 3-5.

3. K. S. Sandford: Paleolithic Man and the Nile Valley in Upper and Middle Egypt, Prehistoric Survey of Egypt and Western Asia, The University of Chicago Oriental Institute Publications, Vol. 3, 1934, pp. 4-8.

4. See K. S. Sandford: The Pliocene and Pleistocene Deposits of Wadi Qena and of the Nile Valley between Luxor and Assiut (Qau), _Quarterly Journal of the Geological Society,_ Vol. 85, 1929, pp. 493-544.

5. W. F. Hume: The Geology of Egypt, Vol. 1, Survey of Egypt, Ministry of Finance, Cairo, 1925, p. 8.

6. In Girga province: Sohag, its capital (14,681 in 1947), Giheina (40,173), Tahta (37,095), Akmim (34,788), and Girga (33,631). Asyut, capital of the province of the same name, had 90,103 people in 1947.

7. Girga province had in 1947 an overall population density of 2119 per square mile and a density of 1807 per square mile outside the towns of over 25,000.

8. See John Ball: Contribution to the Geography of Egypt, Survey of Egypt, 1939, pp. 178-289, The Physical History of the Faiyum and its Lake.

9. See K. S. Sandford and W. J. Arkell: Paleolithic Man and the Nile-Faiyum Divide, _in_ Prehistoric Survey of Egypt and Western Asia, Vol. I, 1929, The University of Chicago Oriental Institute Publications; and G. Caton-Thompson and E. W. Gardner: The Desert Faiyum, Royal Anthropological Institute, London, 1934.

10. Among the numerous plans for the conservation of Nile water, it has been suggested that another depression, the Wadi Rayan, a few miles south of the Faiyum, might be used for the same purpose.

11. See Ball, _op. cit._, Chapter 4, The Birket Qarun Fisheries, pp. 291-302.

12. See C. J. R. Haswell: Cairo, Origin and Development: Some Notes on the Influence of the River Nile and Its Charges, _Bulletin de la Société Sultanieh de Géographie,_ Vol. 11, Cairo, 1922, pp. 171-176.

13. The last of the canals to the Gulf of Suez, 'Amr, "Qanal of the Prince of the Faithful," was closed in 1776 (see Chapter 11, The Suez Canal).

14. The Geography of Strabo, translated by H. C. Hamilton and W. Falconer, London, 1857, Vol. 3, p. 223.

15. See O. Toussoun: Mémoire sur l'histoire du Nil, Mémoires de l'Institut d'Égypte, Cairo, 1925.

16. A mound marking the site of Tinnis is now a small island in Lake Manzala.

17. Alexandria, off the very western edge of the delta, owes its location and growth solely to its harbor and cannot be really considered a delta city.

18. The little village of Sa el Hagar on the east bank of the Rosetta Branch is on the site of Saïs.

19. For descriptions of the main peaks of the Red Sea Mountains and Sinai see G. M. Murray: Egyptian Mountains, The Alpine Journal, Vol. 42, 1930, pp. 226-235.

20. T. Barron and W. F. Hume: Topography and Geology of the Eastern Desert of Egypt, Central Portion, Survey Department, Cairo, 1902.

21. Barron and Hume, ibid., pp. 211-214 and 241-247; and G. Andrew: The Structure of the Esh-Mallaha Range, Eastern Desert, Bull. Institut d'Égypte, Vol. 16, 1933-34 Session, Cairo, 1934, pp. 47-53.

22. For descriptions of Mons Claudianus and other relics of Roman activity in the Red Sea Mountains see L. A. Tregenza: The Red Sea Mountains of Egypt, London and New York, 1955.

23. The Faiyum depression receives most of its water supply from the Nile and is for that reason treated in the section of this chapter which deals with the Nile valley and delta.

24. H. J. L. Beadnell: An Egyptian Oasis, London, 1909, pp. 52-57.

25. W. F. Hume: Geology of Egypt, Vol. 1 ~~A~~, The Surface Features of Egypt, and their Determining Causes and Relation to Geological Structure, Survey Department, Cairo, 1925, pp. 73-74.

26. K. S. Sandford: Geology and Geomorphology of the Southern Libyan Desert, Geographical Journal, Vol. 82, 1933, pp. 211-235, and Geological Observations on the Northwestern Frontier of the Anglo-Egyptian Sudan and Adjoining Parts of the Libyan Desert, Quarterly Journal of the Geological Society, Vol. 91, 1935, pp. 323-381.

27. R. A. Bagnold: An Expedition to the Gilf Kebir and Uweinat, 1938, The Geographical Journal, Vol. 93, No. 4, 1939, pp. 281-283.

28. See Prince Hussein Kemal el Lin: L'exploration du désert de Libye, Géographie, Vol. 50, 1928, pp. 171-183 and 320-336.

29. John Ball: Remarks on 'Lost' Oases of the Libyan Desert, The Geographical Journal, Vol. 72, 1928, pp. 250-258.

30. Hume, op. cit., pp. 31 and 38.

31. See John Ball: Problems of the Libyan Desert, The Geographical Journal, Vol. 70, 1927, pp. 25-26.

32. Ibid., pp. 110-111.

33. John Ball: The Qattara Depression of the Libyan Desert and the Possibility of Its Utilization for Power-Production, The Geographical Journal, Vol. 82, 1933, pp. 289-314.

34. John Ball: Contributions to the Geography of Egypt, Survey Department, Cairo, 1939, pp. 30-31.

35. For administrative purposes the Western Desert is divided into two sections along the parallel of 26°20' North - a northern section, called the Western Desert Frontier Province and including the Siwa, Bahariya, and Farafra oases, with its seat at Mersa Matru; and a Southern Desert Frontier Province which includes the Kharga and Dakla oases and has its seat at El Kharga.

36. The land under crop in all the desert depressions is only a small part of the area enclosed by their bordering cliffs. Dakhla, approximately 50 miles long and 20 at its maximum width, has the largest proportion - an estimated 40 square miles. In Kharga, the largest of them 200 by 30 miles, only about 10 square miles are cultivated; in Bahariya, 60 by 25 miles, around 4 square miles; and in Siwa, 50 by 10 miles, less than 2 square miles. Farafra, smallest of the depressions, with a population of less than 800 according to the 1947 census, is seldom visited even by the nomads and is little known.

37. For the history of Siwa and the life of its present inhabitants and a detailed description of their villages, see C. D. Belgrave: Siwa, the Oasis of Jupiter Ammon, London, 1923.

38. For a description of Kharga Oasis and town and an anthropological report on the inhabitants, see Ales Hrdlicka: The Natives of the Kharga Oasis, Egypt, Smithsonian Miscellaneous Collections, Vol. 59, No. 1, Washington, 1912.

39. For a detailed study of the geology and topography of this section of Sinai, see W. F. Hume: The Topography and Geology of the Peninsula of Sinai, South-Western Portion, Survey Department, Cairo, 1906; and T. Barron: The Topography and Geology of the Peninsula of Sinai, Western Portion, Survey Department, Cairo, 1907.

40. See T. Barron, op. cit., pp. 66-74; and H. J. L. Beadnell: The Wilderness of Sinai, A Record of Two Years' Recent Exploration, London, 1927, pp. 164-174.

41. For a detailed morphological study of the central highland, see H. Awad: La Montagne du Sinai Central, Société de Géographie d'Égypte, Cairo, 1951.

42. H. Sadek: A Scientific Study of Scenery in Sinai, Congrès International de Géographie, Cairo, 1925, Session II, Vol. 3.

43. Beadnell, op. cit., p. 100.

44. T. Barron and W. F. Hume: Topography and Geology of the Eastern Desert - Central Portion, Survey Department, Cairo, 1902, pp. 98-104.

45. A. H. Montasir: Habitat Factors and Plant Distribution in Egypt, Proceedings of the Symposium on Scientific Problems of Land Use held (at Heliopolis) under the joint auspices of the Egyptian Desert Institute and UNESCO, Cairo, 1954, pp. 36-64.

46. M. Drar: Plants of Raw Materials in the Deserts of Egypt, Proceedings of the Symposium on Scientific Problems of Land Use in Arid Regions, op. cit., pp. 70-76.

47. El Qantara is in two sections: Qantara Gharb (West), on the west side of the canal, and Qantara Sharq (East), on the east side. The railroad across northern Sinai, which formerly provided a through rail route between Egypt and Turkey by way of Palestine, connects there with the Cairo-Canal Zone main line. The connection with the Israel railroads has now been discontinued.

48. At Ismailiya, the headquarters town of the Suez Canal Company on the northwest corner of Lake Timsah, the freshwater Ismailiya Canal, excavated in the channel of an old water course to bring fresh water from the Nile to the Canal Zone, branches north and south to parallel the canal to Port Sa'id and Suez.

49. Port Sa'id and the surrounding district, in the residential town of Port Fouad on the opposite side of the canal, has a population of about 180,000, Ismailiya 54,000, and Suez and its suburbs, including its twin ports of Taufiq and Ibrahim, 108,000.

50. Henri Poydenot: Le canal de Suez, Paris, 1955, p. 107.

3. PEOPLE AND SOCIETY

THE PEOPLE OF EGYPT

The Ancient Stock

Egypt has one of the world's most homogeneous populations. Its fundamental element - the peasant stock of the Nile valley and delta - is a strongly coherent social and cultural community, and it has kept the physical characteristics of its ancient Hamitic forebears practically unaltered, at least since Pharaonic times. This stock and migrants from it to the towns and cities constitute about 88 per cent of the total population of the country.[1]

Skin color in the Nile delta, owing to admixture with Arab invaders, is generally lighter than in the valley, and in the lower valley it is lighter than in the far south, where there is evidence of the influence of dark-skinned neighbors. But throughout the valley and delta, the peasants (fellahin, as they are commonly called), with their considerable heights, broad shoulders, narrow hips, straight, wide-nostrilled noses, and full lips, are scarcely to be distinguished from the Egyptians portrayed in carvings and paintings in the pyramids and temples of the Pharaohs.

The ancient Egyptians were not of Negro origin. They were however, both related to the Libyans or other North Africans and to various East African tribes such as those now called Galla, Somali, and Bega; and a strong Semitic infusion was added by nomad invaders from southwest Asia.[2]

There have also been many other infusions of foreign elements in the population of Egypt. With the numerous invasions of the country it could not have been otherwise. But in the rural districts there was little settlement of foreigners, and whatever new physical characteristics may have been introduced have been absorbed into the old stock and have left practically no trace. Although intermarriage of the peasant population with neighboring Bedouin nomads might have been expected, the Bedouins whether nomads or settlers, have always looked upon the fellahin as belonging to a distinctly lower order than themselves, and have, by and large, disdained to mix with them.

In urban centers this homogeneity of the Egyptian population is also strongly evident. In the cities and larger towns, particularly in the delta and along the Mediterranean coast, considerable numbers of foreigners - Greeks, Italians, Arabs, Turks, Armenians, and Jews, mostly, and more recently, French and English - have settled since the earliest invasions of the country.

Before the conversion of the great majority of the population to Islam, foreigners were not barred from marrying the indigenous Egyptians, but since then intermarriage has been limited mainly to those from the Moslem countries, since the Koran strictly forbids the marriage of Moslem women outside their faith, although it permits and even approves of marriage of

Moslem men with non-Moslem women. As a result of the earlier mixtures, many residents of the cities and towns, especially along the north coast, although classed as native Egyptians, show strong evidence of European racial stocks. But migrants from the Egyptian rural population are gradually absorbing these foreign strains in the urban centers.[3]

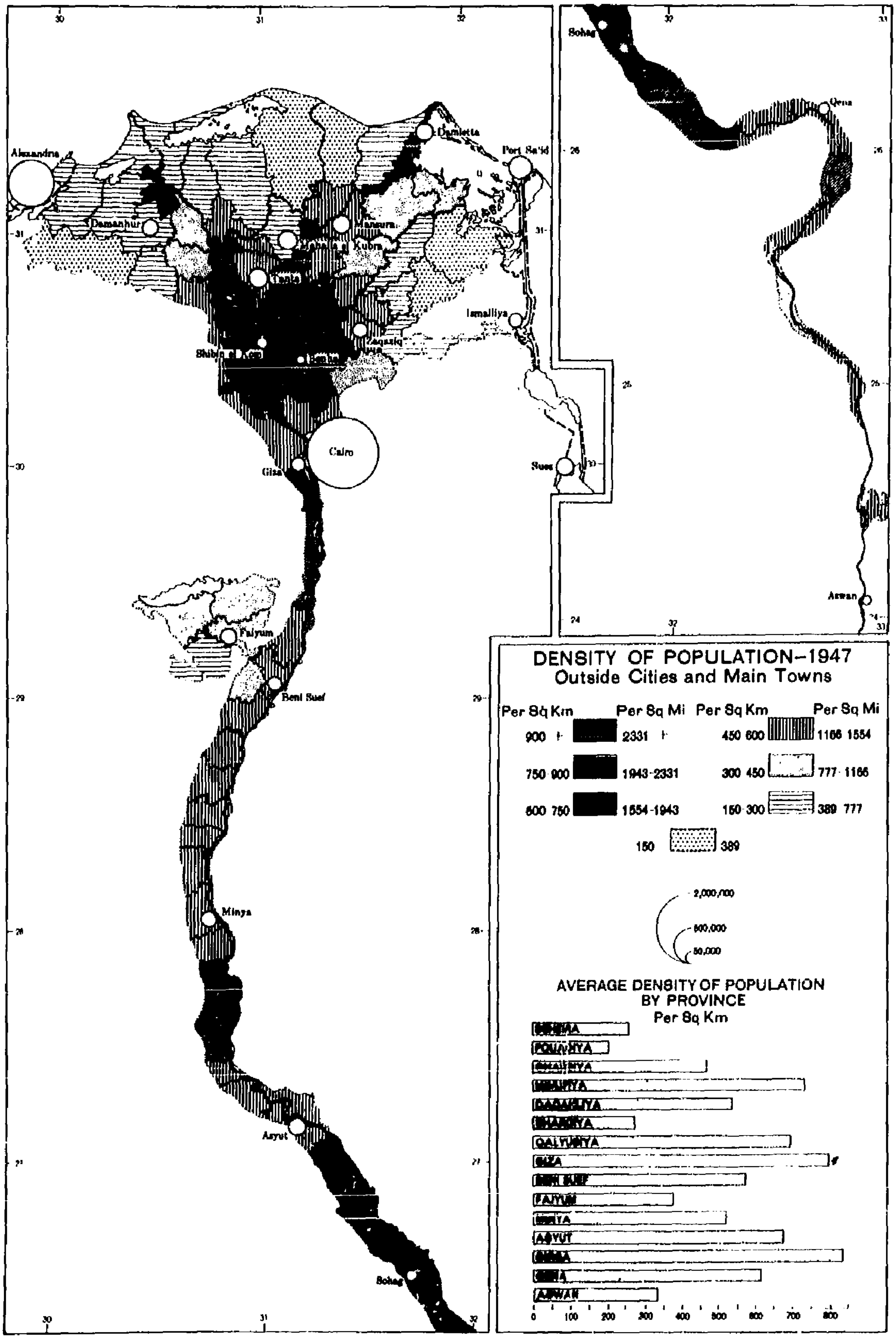
The Arabic Language

Arabic is the official language of Egypt, but not its historic tongue. The language spoken by the people of the Nile valley and delta before the time of the Arab invasion, and probably descended from the ancient Egyptian tongue is known as Coptic. But Coptic died out rapidly after Arabic was made the official language. Since the early sixteenth century it has been a dead language, used only in the liturgy of the Coptic Church. Arabic is now the language of Copt as well as Moslems.

Classical Arabic, the language of the Koran, is the written language of Egypt, the language spoken on all formal occasions, and the language of all textbooks. But the Arabic spoken throughout the country is a colloquial Arabic, corrupted in both vocabulary and structure by the influence of the old local dialects and the intrusion of many foreign words and expressions. Coptic, Turkish, French, Greek, and Italian words and expressions have all been molded into it. For the great mass of the people, consequently, to learn written Arabic is almost like learning a foreign language. But while the colloquial Arabic of Egypt differs noticeably from that of the other Arabic-speaking peoples, the variations are not so great as seriously to hinder communication between them. Even in Egypt itself there are dialectical differences between the people of the delta and the valley and between urban and rural folk.

Classical Arabic is a difficult language to master. The alphabet consists of twenty-eight consonants, of which a few take on long vowel sounds. These other vowel sounds are used, but if they are indicated at all in written Arabic, it is only by vocalization marks. In most writing these marks are omitted, however, and have to be supplied mentally by the reader, which requires a considerable knowledge of the language. There is a trend on the part of men of letters and journalists to combine the classical and colloquial languages, with a strong leaning toward the latter, and to modify the classical syntax.

Although some colloquial Arabic is known to the desert people of Egypt, the common tongues of many of them bear no relation to Arabic. Hamitic dialects are spoken by the 'Ababda and Bishari tribes of the southern part of the Eastern Desert, but the former also uses colloquial Arabic as an adopted language. The Nubians of the southernmost part of the Nile valley speak a language related to a group of African tongues. In the Siwa Oasis a Hamitic language akin to that of the Berbers of North Africa is spoken.


DENSITY OF POPULATION–1947
Outside Cities and Main Towns
Per Sq Km
Per Sq Mi
900 +
2331 +
750 900
1943-2331
600 750
1554-1943
450 600
1166 1554
300 450
777 1166
150 300
389 777
150
389
2,000,000
500,000
50,000
AVERAGE DENSITY OF POPULATION
BY PROVINCE
Per Sq Km
0
100
200
300
400
500
600
700
800
Alexandria
Damanhur
Tanta
Mansura
Damietta
Port Sa'id
Ismailiya
Zaqaziq
Shibin el Kom
Cairo
Giza
Suez
Faiyum
Beni Suef
Minya
Asyut
Sohag
Qena
Aswan

Islam

Islam is the state religion of Egypt. The Moslem population of 17,397,946 enumerated in the census of 1947 was 91.7 per cent of the total. Thus an Islamic-Arabic culture dominates the life of the Egyptian people. The Coptic Egyptian is scarcely distinguishable from his Moslem compatriots, except in religious observances, and in the Coptic prohibition of polygamy and divorce and exemption from Islamic dietary laws. Ancient cultural traits and long contact with the Western world and with other religious sects have, however, imparted a regional flavor to Islam in Egypt which manifests itself in a broader outlook toward western civilization than is to be found in most other Moslem countries and a more tolerant attitute toward other religions. For most Moslems, however, the Islamic doctrine of predestination and the belief that men cannot avoid their preordained fate on earth powerfully affect attitudes toward life. Islam engenders a spirit of resignation to fate and makes acceptance of one's lot on earth, however poor, an act of religious submission.

Another deterrent to material progress has been the Islamic prohibition of usury and gambling, which is widely interpreted as forbidding investment in industrial and commercial enterprises, bank depositing, purchase of insurance, and the like. This prohibition, like the Islamic dietary laws, which prohibit the drinking of alcoholic beverages and permit the eating only of fresh-killed meat and none of pork, raises barriers between Moslems and those not subject to these restrictions.

His religious beliefs are most important to the average Egyptian Moslem. This feeling is to be seen in his faithful observance of prescribed religious duties and in the reverence he pays to deceased religious leaders and relatives of the Prophet Mohammed. His ritual religious duties are four: ablution and prayer five times daily - at sunrise, noon, afternoon, sunset, and evening; almsgiving, both obligatory and voluntary; fasting from sunrise to sunset during the month of Ramadan, the ninth month of the Islamic calendar; and a pilgrimage to Mecca once in a lifetime, conditions permitting. Although Islam has no priesthood, confers no sainthoods, and does not recognize the divinity of anyone who has lived on earth in human form, Moslems hold in great respect the exponents of Islamic theology and law (the ulemas, as they are called). They also visit the tombs of their religious leaders and of relatives of Mohammed - whose birthdays they celebrate with much festivity - as acts of homage to God. Some of these festivities last for days and even weeks, periods of thriving business in the communities where they are held.

Although for all ordinary purposes the Gregorian calendar is used in Egypt, the sequence of religious events is based on the Islamic calendar. This is an uncorrected lunar calendar which begins with June 20, 622 A.D., the date of the flight of Mohammed from Mecca to Medina (Higra or Hijra) and is divided into twelve lunar months, each month commencing with the new moon. The mean length of the Islamic year is thus 354 1/2 days, or about eleven days less than that of the Gregorian calendar, and the months retrograde in a cycle of about thirty-two and a half years.[4]

Outstanding events of the Islamic year are the festivities in celebration of the Birthday of the Prophet (the second week of the third month), the Fast of Ramadan (all of the ninth month), Ramadan Bairam (a minor festival to celebrate the breaking of the Ramadan fast), and Kurban Bairam (a great festival on the tenth day of the last month of the year).

The most important of these is Ramadan, and much significance is attached to its strict observance. Fasting is prescribed from sunrise to sunset, on the principle that restraint of physical appetites frees the spirit for communion with God. When Ramadan occurs in summer, with the long hours of sun, observance of the fast is extremely arduous. It is particularly difficult of observance when it occurs at the time of planting or harvesting of a major crop, since it can scarcely fail to result in a general slackening, or even abandonment of normal activities. The daylight fast is relieved by much gaiety and feasting at night, often lasting until daybreak. The three days of the Bairam, which immediately follows Ramadan, are a time of almsgiving.

The pilgrimage to Mecca is compulsory, but only for those who can accumulate or borrow the funds for the journey and are physically able. The pilgrims are assembled at Suez, under a leader appointed by the government, and go by boat from there to Jidda on the Red Sea coast of Arabia. There is a stopover at a quarantine station at Tor, on the west coast of Sinai, where the pilgrims are examined for communicable diseases. From Jidda on, the journey is overland.

In addition to the daily prayers, and the festivals, fasts, and pilgrimages, Islam is kept constantly and conspicuously in the foreground by the teaching of the Koran in the public schools and by the study of Islamic and Arabic literature and Islamic law in mosque schools and at El Azher, the ancient Islamic university in Cairo, and its preparatory institutes. Many religious institutions require that the entire Koran be committed to memory. Readings from the Koran are a feature of all communal assemblies, and passages from it are read at festivals and mournings and are broadcast daily by radio. There are numerous professional Koran readers. Guided by the Koran, Islamic courts handle many civil cases, in particular cases respecting inheritance, marriage, divorce, and other family matters.

Teachers of Islam and judges of Islamic courts are called sheikhs and are regarded with great respect. Their distinctive dress - a long wide-sleeved silk robe, belted at the waist with a wide, folded scarf, a long, semifitted coat, and a white turban wound around a tasseled red skullcap - is in conspicuous contrast to both the western garb now much seen in cities and towns and the simple, loose-fitting garments of the masses of the people.

The Moslem Woman.

Although there is nothing in the tenets of Islam which forbids the association of women and men on an equal basis, in Egypt, as in most Eastern countries, both Moslem and non-Moslem women have traditionally

been relegated to the background - household tasks and the rearing of children. They are now, however, coming to play important roles in many fields. Co-education in the universities (except at El Azher) has done much to broaden their activities; considerable numbers of women are now enrolled in all university departments.

While the veiling of women in public and their seclusion have both been long-standing practices among Egyptian Moslems, as among Moslems generally, neither is decreed by Islam. Both customs derive from the ancient Middle East. Neither was ever much practiced by the women of Egypt's agricultural population, and although there is still considerable segregation of the sexes among some middle-class Egyptians, rigorous seclusion has now been practically abandoned among the townspeople. The veil, too, is hardly worn anymore, except by a limited number of working-class women in the cities and towns.

Islam in fact brought women considerably greater freedom than had previously been their lot in the Middle East. It established them as legal personalities with the right to inherit and otherwise acquire property and to manage it without the intermediation of husband or male guardian. Moreover, although the Koran condones polygamy, it by no means decrees it. In fact it would appear to discourage the taking of more than one wife. Although it permits as many as four, that is the limit, and it adds the injunction that "If you fear that you may not be fair to them, then marry only one...and you will not be fair, no matter how you try." Polygamy is now very much on the decline in Egypt; the 1947 census reported only 3.6 per cent of married men as having more than one wife.

Islamic law does, however, make divorce a simple procedure for the husband. The present Egyptian rate of about thirty divorces to a hundred marriages is one of the highest in the world. The wife is seldom granted the right of contest; a woman can have the same privilege of easy divorce that her husband does only if he consents including a clause to that effect in the marriage contract. Women may, however, sue for divorce in court. Islamic law deters abuse of the right to divorce by requiring the husband to pay his divorced wife alimony commensurate with his means for the support of children, if any. Also, since the groom pays the marriage dowry, the bride's family customarily holds a portion of this in reserve as a contribution to her support in case of divorce or the death of the husband.

MINORITY GROUPS

Small numbers of Arabs have, as has been shown, mingled with the Egyptian population since before the Arab conquests. In addition, there is a more or less pure Arab group that constitutes about six per cent of the total population. In the cities and towns many of these Arabs are shopkeepers or in domestic and public service. There is also, however, a considerable number of upper-class Arab families long settled in the country and engaged primarily in commerce and trade. Outside the valley and delta there are nomadic Arabs (the Bedouins of the desert) and settled Arabs,

though most of the latter are actually only semisettled, since they also get part of their livelihood from their flocks. The "settled" Arabs are found mainly in the Red Sea district of the Eastern Desert and Sinai and to some extent along the coast west of the delta.

Berbers predominate in the settled population along the coast of the delta and are almost exclusive occupants of the oases and cultivable wadis of the Western Desert. Nomads, whose number was estimated in the 1947 census as 55,073, include the true Bedouins, and in the southern part of the Eastern Desert, four other tribes -the Hadendoa, Bishari, 'Ababda, and Blemmye, whose ranges also extend well into the Sudan.

The Copts

The Copts, so-called from their adherence to the Coptic Church, the early Christian church to which most of the Egyptian people belonged until the Arab invasion of the mid-seventh century, claim to be the purest descendants of the ancient people of the valley and delta. With seven per cent of the population (1947), they constitute the second largest religious group.[6] In the towns and villages, where Copts have a long background of occupation in such sedentary pursuits as the finer handicrafts and business and trade, they are generally of more delicate feature and lighter frame than their Moslem neighbors. Their religion has also prevented them from intermarrying with any later foreign elements. But the Coptic small farmer is in no way to be distinguished physically from his Moslem neighbors. According to tradition, what came to be the Coptic Church was founded in Alexandria by St. Mark about 40 A.D., and it was probably well established by the middle of the last century of Roman rule (30 B.C. -c. 300 A.D.). (The name Copt is probably either (1) derived from Coptos, the Romanized form of the name given by the Greeks to a town at or near the site of the present valley town of Qift, to which large numbers of the Egyptian Christians fled from persecution by the Romans, or (2) a Europeanized form of Kibt or Qift, an Arabic adaptation of Aegyptus, the name applied to the country by the Greeks.) Until the fifth century the Church of Alexandria was second only in importance to the Church of Rome. Anasthasius, who in 325 A.D., at the Council of Nicea, won acceptance of the doctrine of the Trinity for the great body of the Christian Church as against the Unitarianism of Arius, became patriarch of the branch of the church which was later called Coptic. The patriarch of the Coptic Church is still called the "pope and patriarch of the great city of Alexandria and of all the land of Egypt, of Jerusalem, the holy city, of Nubia, Abyssinia, and Pentapolis," but his jurisdiction outside Egypt now extends only to the Abyssinian branch of his church. Monasticism was an early practice of the Egyptian church, and its bishops must still be monks. A number of the ancient monasteries are still occupied.

Under both Arab and Turkish rule the Copts endured much persecution, and millions embraced Islam for that reason, as well as because they were attracted by the simplicity of its doctrines as compared with the obscurantism and schisms in their own church. Owing to ignorance and a lack of leadership among the Coptic priests, this defection is still going on; each year a few hundred go over to

Islam and a small number to various Christian churches.

Because they were discriminated against in the past in the matter of land ownership (only after the British occupation were any but Moslems permitted to own land), the Copts generally turned to handicrafts, and the more intelligent of them to trade and to intellectual pursuits, as did the Jews of Europe under similar conditions in the Middle Ages. More interested in education than were most of their Moslem compatriots, many Copts have advanced to subordinate administrative positions in government since the latter half of the eighteenth century. This interest has continued; according to the 1947 census the illiteracy rate among the Copts was 57 per cent, as compared to 79 per cent among the Moslem population; although the Copts constitute only 7 per cent of the population, they furnish about 20 per cent of the school and university enrollment.

Not until the British occupation, however, did the Copts of the towns and cities begin to abandon their semi-fortified quarters, give up their distinctive dress, and mingle on more or less equal terms with the Moslems. Under the Organic Law of 1883 they were for the first time assured of representation in the Legislative Assembly,[7] and in 1908 a Copt was appointed to the premiership. On the other hand, when the British took over the higher administrative positions in government, the Moslems who had held them were reduced in authority, replacing the Copts who had previously more or less monopolized the lower ranks. This induced still more Copts to go into banking, trade, and the professions. But free at last to own land, many of them turned to agriculture, and a number are now among the country's large landowners. Copts are now well represented, also, among the small landowners.

The Copts are most numerous in the Nile valley. According to the 1947 census, 57 per cent of them live in four valley provinces - 21 per cent in Asyut, 15 in Girga, 14 in Minya, and 7 in Qena. In general more Copts live in the towns and cities than in the rural villages. They form a large proportion of the population of many valley towns and are particularly numerous in Asyut, Tahta, Akhmin, Qift, Luxor, and Isna. More than a quarter of a million Copts (about 16 per cent of all Copts in Egypt) live in Cairo, where they constitute 10 per cent of the population.

In spite of the increase in school and university attendance among the Egyptian Moslems in recent years, the Copts still occupy governmental and professional positions quite out of proportion to their numbers, and as a result there has been a revival of anti-Coptic feeling in certain quarters. Discrimination against the Copts is not entirely a matter of the past. They are almost completely excluded from the Egyptian army, and in not a few rural villages that have a mixture of Copts and Moslems, the former have reason to complain of unfair treatment by their Moslem neighbors.

Other Religious Groups

Some 155,600 members of other Christian denominations, mainly of the Greek Orthodox Church, and 65,639 Jews were reported. Except for the relatively small number who are converts from the Coptic Church or the descendants of

converts, these other Christians are almost exclusively foreigners or Egyptian citizens of foreign ancestry. The Jewish group has since been considerably reduced as the result of the conflict between Egypt and Israel. All of these non-Islamic groups have had, at least until recently, official recognition and full freedom of worship, but any attempt at proselytizing of Moslems is forbidden under penalty of the law.

Foreign Residents

Of 18,820,852 Egyptian citizens, according to the 1947 census, only 36,702 were reported as of foreign birth. Of these the largest groups were of Greek (9965), Turkish (5139), Syrian (4750), Sudanese (4085), and Armenian (3334) origin. On the other hand, 143,915 alien residents were enumerated. Of these the most important groups were 57,427 of Greek, 28,246 of British, and 27,958 of Italian nationality. Most of those reported as of British and Italian nationality, however, were not from the mother countries. A large number of the "Italians" were from Italy's African colonies, and of the "British" only 19,754 were actually from Great Britain, the remainder being Maltese, Cyprians, Indians, and others. Of those reported as French nationals, the fourth largest group, 7622, were from France; the remainder, a total of 9717, came from French departments and territories in Africa and from the former French mandates of Syria and Lebanon.

The British group has decreased greatly since the 1947 census was taken. A large number of those from Great Britain were engaged as teachers in secondary schools and colleges. Most of these left the country during the anti-British outburst of 1951, and following the settlement of the Suez Canal difficulties in 1954 and the departure of the last British troops from the Suez Canal Zone in June, 1956, many more of the British civilian residents left.

The majority of resident aliens (94 per cent of them in 1947) are in Alexandria, Cairo, Port Sa'id, and Suez. Alexandria and Cairo have by far the greatest concentrations of them (43 and 38 per cent, respectively, in 1947).

THE FELLAHIN

Fellah (plural fellahin), as the Egyptian peasant is commonly called, is Arabic for tiller of the soil. Probably at least 70 per cent of the population of Egypt are true fellahin, living on the land and getting their living from it by their own labor. A much larger percentage is of fellahin stock, since, as has been mentioned, the towns and cities have grown chiefly by immigration from the farms.

Working his own small plot of land, or as tenant or day laborer on the larger holdings, the fellah is the mainstay of the country, producing nearly 40 per cent of the national income and supplying 94 per cent of the country's exports. Crop for crop he obtains yields from his soil that are among the world's highest, and for a number of crops the average yield he gets is nowhere surpassed.

The Egyptian fellahin as a group have been described as the most miserable people on earth. They live almost without exception in small, closely packed villages and hamlets. Lanes zigzag among the house, usually so narrow as barely to permit passage except at the village center, where there may be a store, a shop or two, and the house of the omda, the government-appointed village chief. A pool outside the village-a water-filled hole where the mud was dug for the village houses - and a community threshing floor are also common.

The low houses, built of sun-dried, Nile-mud bricks, blend almost indistinguishably with the surrounding fields, although there may be a few date palms and other fruit trees to break the monotony. The houses are single-roomed, or of one room and a narrow entrance hall that may serve as kitchen and sleeping quarters for some members of the family. They are roofed with mud spread over layers of date-palm leaves on date-palm rafters and are windowless except for small openings above eye height. The roof, reached by an outside stairway, is mainly a storage place for the cotton and corn stalks and dung cakes used for fuel. A small, mud-walled courtyard at the back of the house is both house yard and enclosure for the buffalo, cow, or donkey, or all three. In it stands a huge earthenware jar in which is cooled and settled muddy water from the Nile, or a canal, or the village pool, the only water supply except in an occasional village where there is a well, with or without a pump. A mud-baking oven built into the house wall and opening into the court is also part of the equipment of every household. House furnishings consist of a low table, a few mats and cooking utensils, the ubiquitous molasses jug and cheese crock, and perhaps a sheepskin on the earth floor, the wife's dower chest, and a crude bedstead of palmwood and palm-leaf ribs.

There is little home life for the fellah and little recreation. He may participate in religious festivals or occasionally foregather with his fellow villagers at the village store for much conversation and many cups of sweet, hot tea. Except for his bubble pipe, tea is his only addiction now that hashish is forbidden.

The clothing of the fellah and his family is simple and standardized; there has been no change in style for generations. The attire of the completely dressed male is a loose, ankle-length, collarless gown of blue or brown, called the gallabiya, and under it wide cotton drawers or a loin cloth, a loose shirt, and a cotton vest, and on the head, a brown felt skullcap which he sometimes wraps with a scarf to form a turban. Commonly the fellah wears only the gallabiya and drawers or loin cloth. At work in the field he is apt to remove the gallabiya, but his skullcap is never discarded. Women wear a long-sleeved, cotton dress with trailing flounce over a long chemise and long, wide drawers and for out-of-doors, a black cloak which covers the head and may be drawn over the face. For adornment the women wear bracelets, anklets, and many necklaces with bright settings. Gold and silver coins strung for necklaces and bracelets are a favorite investment, and women of the more prosperous farm families may wear a small fortune.

The fellah is often criticized as indolent and slow, but he is at work with his crops throughout the daylight hours. He is in the field at dawn seven days of the week, after a breakfast that usually consists of leftovers from the meal of the night before. His sons, for whom he finds many tasks when they are still very young, accompany him or join him later. The women of the family bring him his midday meal and may work with him, if their household tasks are done. Not until dusk does he go back to the house for his one hot meal of the day, and if he is pressed for time during harvest or while irrigating a crop, he may return to the field to spend all or part of the night there.

Concurrently with the development of the irrigation system, it might be expected that the fellah would have learned correspondingly modern agricultural methods. He has come to use commercial fertilizer, as heavy cropping under perennial irrigation has depleted his soil of its natural fertility, but only as a result of governmental insistence that fertilizer be applied to cotton plantings. Even now the fellah is inclined to think of fertilizer mainly in connection with his cotton and, since cotton is his principal cash crop, to rob his other crops of the fertilizer allotted for them in order to give cotton an extra application. He uses government-tested cottonseed of the varieties that have been proved best for his particular locality, but only because the government will not permit him to plant any other. He picks the insect - and fungus-infested leaves and bolls from his cotton plants because government inspectors have taught him how and when to do so and see to it that he does. As his land has been changed to perennial irrigation, he has learned when and how much water to apply to a particular crop, but although he never underwaters, if plenty of water is available he is apt to water more than is necessary, in order to be sure that he is getting his full share. Where perennial irrigation is provided he has learned, too, the necessity of adopting a system of crop rotation for the replenishment of his soil - a matter that he hardly needed to consider when his land was under one-crop basin irrigation, with its long fallow season.

Otherwise there is nothing of modern agricultural science in the fellah's methods, and he resists the adoption of new methods, even though he may have seen their superiority demonstrated in heavier crop yield. With 94 per cent of the landowners owning no more than five feddans (a feddan is 1.038 acres) and 70 per cent of them no more than one, the fellah is constrained to get the utmost return from his land. Long practice in this, plus the abundance of available labor, has produced a gardening type of farming. Past generations have acquired and passed on to the fellah of today a practical knowledge of soils, seasons, crops, and crop behavior that, combined with his industry and devotion, serve him well.

Most of the fellah's food is cereals and vegetables he has grown himself. Meat and fowl are luxuries indulged in only at an occasional festival. The staple diet consists of flat cakes of unleavened corn bread, supplemented by onions, cheese, dry legumes, and various green vegetables in season. Monotonous though this diet is, it appears to be nutritionally fairly adequate. Disease, not hunger, makes the fellah indolent, if he can be properly so called, and shortens his life. While enabling him to

feed two mouths on land that could feed only one under basin irrigation, perennial irrigation has brought him his chief affliction, bilharziasis, a form of schistosomiasis, caused by blood flukes for whose ciliated larvae a species of snail in the irrigation canals is an abundant host. It is estimated that 75 per cent of the rural population is afflicted with this disease and probably 30 per cent with hookworm. [8]

Village Isolation

A striking feature of the Egyptian rural villager and of his village as a whole is their aloofness from nearby villagers and villages. This living of each village unto itself springs both from tradition and environment. During the thousands of years when agricultural practice was mainly a matter of permitting the Nile to flood the land during its annual high-water period, of waiting for the water to drain off, and then of planting, cultivating, and harvesting, groups of cultivators crowded together on natural or artificial mounds above floodwater level. For thousands of years, also, there was no private ownership of land for the small farmer, and the villagers who had so grouped themselves together were tied to their villages by edict for land allotment, taxation, and forced-labor purposes.

The resulting aloofness between village and village has continued since private ownership of land developed in the mid-nineteenth century. This stems in part from the conservatism of the fellah, who clings to the way of life of his ancestors, including their type of clothes, their farming methods, and their tools. But it is a product, also, of the natural environment. Soils, climate, and water supply are so nearly uniform throughout the valley and delta that villages are not dependent upon one another and consequently do not need intercommunication. Each is completely self-sufficient, so far as the conscious needs of its people are concerned. No fellah has any urgent reason for leaving his village if he can support his family on the land he owns or rents or the work that he can get on other land nearby. What few necessities he must buy can be bought at the village store or from the traders who bring their wares to the weekly village market, as they have from time immemorial. At the market, exporters' agents and buyers for town and city markets and manufacturing establishments buy his cash crops and whatever surplus he may have of other farm products and livestock.

Many a fellah, however, does leave his village. Though he rarely visits a neighboring village and still more rarely changes his abode from one village to another, he migrates in fairly large numbers to towns and cities. In fact, since the Egyptian towns and cities are relatively new, as compared with the villages, their population is largely of fellahin ancestry, and migrations to them from the rural districts is a more or less continuous process. Those who migrate are mainly the landless farm laborers and the heirs to holdings so small that their share of the patrimony cannot support them and their families. The movement is predominantly to the industrial centers of the delta, rather than to the valley towns, and a good part of it is the result of recruitment by hiring agents.

Rural Social Centers

The poor living conditions of the fellahin and the need for improvment have not gone unnoticed by Egyptians concerned with the welfare and progress of their country. Not until 1939, however, did the government take any definite steps. In that year a Ministry of Social Affairs was created with a special Rural Department. This department has established many Rural Social Centers.. By 1951, 136 such centers, each designed to serve some 10,000 people, were in some stage of development. [9]

According to the plan, each center, when completed, would provide the services of a trained "social agricultural expert," a resident physician, and a visiting nurse. Centers would include a lecture hall, rural library, clubrooms, out-patient clinic and isolation ward, rooms for mother-and-child welfare work, and a maternity ward. Space and facilities were to be furnished for demonstration of and practice in cottage industries and modern agricultural methods. Participation of the prospective users of these centers was to be secured by requiring that each community must contribute £E 1,500 ($4,305) to the £E 7,100 ($20,357) estimated as the cost of building and furnishing a center - and two feddans of land for the buildings. The present government has retained the Ministry of Social Affairs in its Cabinet and has expressed its intention of greatly expanding the Rural Social Center program.

EDUCATION

Illiteracy

According to the census of 1947, 77 per cent of all Egyptians were completely illiterate (see Tables 1 and 2).[10] Except for the governorate cities, no distinction was made in the census between urban and rural population, but even in Cairo and Alexandria the rates were 55 and 59 per cent, respectively, and they ranged between 60 and 70 per cent in the others. Only in the delta provinces of Daqahliya, Minufuya, and Qalubiya and in Giza, the northernmost of the valley provinces, was illiteracy below 80 per cent. And of those reported as able to read and write, 89.6 per cent had attended only an elementary school, and only 8.8 per cent had certificates from schools above the elementary level.

Government Control of Education

Most of the educational institutions in Egypt, from the elementary schools through the universities, are state institutions. The public schools, below the college level, are all under the control of the Ministry of Education, as are a rather large number of private schools operated by various Egyptian religious and lay organizations, all of which receive government aid. The official statistics for the school year 1951-1952 reported 733 of these private schools, with an enrollment of 324,180 pupils. A number of schools established many years ago in the major cities and towns to serve Armenian and Jewish communities of Egyptian citizens are included in this group - nine Jewish

Table 1 - Literacy and Illiteracy, 1947

(All Persons Five Years of Age Or More)

	Male	Per cent	Female	Per cent	Total	Per cent
Literates	2,561,372	31.6	998,206	12.1	3,559,578	21.8
Illiterates	5,248,986	64.7	6,825,305	82.5	12,074,291	73.6
Not stated	301,788	3.7	446,293	5.4	748,081	4.6
Total	8,112,146		8,269,804		16,381,950	

Table 2 - Literates by Educational Status, 1947

Status	Males	Females	Total
Able only to read	49,982	17,493	67,475
Able to read and write	2,215,946	906,397	3,122,343
Holders of primary certificates	145,415	53,482	198,897
Holders of secondary certificates	96,629	16,801	113,430
Holders of higher certificates	52,036	3,476	55,512
Holders of higher certificates from abroad	1,364	557	1,921
Totals	2,561,372	998,206	3,559,578

and eight Armenian with a total enrollment of 4961 in the school year 1951-1952. Also reported for the year were 281 foreign schools - mainly American, English, French, German, Italian, and Greek. Most of these were founded and are maintained by church missions, but a number have been established by groups of foreign residents who maintain them directly. Well over half of the 94,539 pupils enrolled in these foreign schools in 1947 were Egyptians.[11] Of foreign educational institutions the American University and the American College for Girls, both in Cairo, alone provide education at the college level, and both are small.

Egyptian universities are all state institutions, but they are under the control of their respective councils, and government funds for their maintenance and development are allocated in the annual budget separately from those for the Ministry of Education. For a number of years the allotment for education in the National budget has been second only to that for the Army and Navy. For the fiscal year 1951-1952 it was £E 25,649,000 ($52,340,000), or about one eighth of the total budget.[12]

Nineteenth Century Europeanization

Education along Western European lines was first attempted by Mohammed Ali (Governor-General from 1805 to 1849) early in the nineteenth century, with a predominately French orientation. This was a revolutionary change. Up to that time the traditional Islamic system, concentrating on religion and philosophy, had reigned uninterrupted for more than a thousand years. Schools were of two types - the kuttab and the madrasa. In the kuttabs, or elementary schools for teaching the Koran, some attention might be given to reading and writing Arabic and to simple arithmetic, but the chief feature of instruction was and to some extent still is rote memorizing of passages from the Koran. In the madrasas, or mosque schools, of which the most important was at the mosque of El Azher in Cairo, elementary education was similar to that in the kuttabs, but in the more advanced schools, particularly in El Azher, there was additional instruction in Islamic law and Arabic literature. Mohammed Ali also sent students to European schools and universities, hoping they would return to set up special technical, medical, military, and language schools. These innovations were not, however, very successful. For lack of other teachers, the mosque of El Azher continued to supply teachers for the elementary schools. The result was that there was little, if any, improvement over the kuttab methods, and the pupils were unprepared to handle new subject matter in the special schools. Ismail (Governor-General from 1863 to 1867 and Khedive from 1867 to 1879) somewhat improved instruction in certain of the primary and secondary schools and greatly increased their number, but on the whole failed to raise their standards.

Mohammed Ali's opening of Egypt to contacts with western Europe did, however, lead to the establishment of many foreign schools. By the end of the reign of Ismail, there were about 200, most of them mission schools. Of the pupils enrolled in them in 1878, 52 per cent were Egyptians nationals.[13]

Education under British Occupation

The British occupation in 1882 gave a further impetus to development along modern lines, but this was mostly at the primary and secondary levels and the principal objective was preparation for secretarial and minor office positions. The budgetary allotments for education during the occupation were meager at best. Little attention was given to the elementary schools, which were the only schools available to most of the people. Tuition fees, which had been introduced in the primary and secondary schools by Mohammed Ali, were not abolished in the former until 1944 and in the latter until 1950. The interest of the British in education above the secondary level appears to have been to develop a class equipped for certain types of government service rather than for professional and technical work.

Steps toward Systematic Organization and Development

Development of a systematic educational program began only after Egypt was declared independent in 1922. The new constitution made elementary education compulsory, in principle at least, and initiated a broad plan for expansion of the whole educational system. In September, 1925, 762 new elementary schools were inaugurated and in the next quarter century new elementary and primary schools were opened at the rate of 150 to 200 a year. Under a new system set up in 1950 (discussed below) schools now designated as primary, post-primary, and preparatory take the place of the former elementary and primary schools and the first two years of the former secondary course. For the academic year 1954-1955, the combined enrollment was reported as 1,788,397 in 7492 schools, as compared to only about 250,000 in the elementary and primary schools in 1920 (see Table 3). Even so, the 1954 enrollment accounted for only about 40 per cent of the total number of children between five and fourteen years of age.

The law compelling elementary school attendance could be enforced, of course, only where there were schools to attend, and schools were, and still are, by no means everywhere accessible. (The serious nature of the shortage is indicated by an announcement that the government proposes to allot funds from the annual budget to build 350 schools a year, until the present deficiency is made up.) In rural Egypt, where various field tasks are traditionally assigned to the farm children at an early age, regular school attendance is apt to be considered of little importance. Evidence of the shortage of schools, the failure to enforce the compulsory school law, and the general apathy toward school attendance is to be found in the prevalence of illiteracy, as already discussed.

The Present School System

A complete reorganization of the school system, initiated in 1950, provides for four stages of schools - primary, post-primary, preparatory, and secondary.

The primary schools, which take the place of former elementary schools and of two years of the former primary schools, are by law

Table 3 - Enrollment in Educational Institutions, 1954-1955*

Stages	Male	Female	Total
Public Schools			
Primary and Post-Primary	916, 154	558, 800	1.434, 954
Preparatory	277, 106	76, 337	353, 443
Secondary (academic)	91, 639	16, 666	108, 305
Secondary (technical)	6, 650	---	6, 650
Secondary (agricultural)	2, 705	---	2, 705
Secondary (trade)	3, 087	569	4, 656
Secondary (domestic science)	---	3, 389	3, 389
Institutes			
Teachers Training Institutes	14, 672	12, 189	26, 861
Higher Institute for Women Teachers	---	766	766
Higher Institute for Men Teachers	436	---	436
University Faculties			
Arabic Studies	13, 885	788	14, 673
Law	10, 807	760	11, 567
Commerce	7, 033	1, 861	8, 894
Veterinary	6, 473	813	7, 286
Arts	4, 307	1, 869	6, 176
Science	2, 666	272	2, 938
Medicine	1, 612	813	1, 947
Engineering	462	22	484

*Adapted from table in "The Egyptian Revolution in Three Years, 1952-1955" (Booklet published by the Information Administration, Egyptian Government), 1955, pp. 124-125.

compulsory for all children between six and twelve years of age. This is the only compulsory stage and the law still cannot be generally enforced because of lack of both schools and qualified teachers.

Four post-primary schools - designed for those who cannot, or do not wish, to go on to a preparatory school - were opened during the 1953 - 1954 school year. The post-primary curriculum leans heavily toward practical training. Agricultural courses are emphasized in the rural districts and manufacturing trades and commercial subjects in the urban centers. Girls' schools offer courses in housekeeping activities, domestic service, and home economics. The full post-primary course lasts three years.

The recently introduced preparatory stage incorporates what were formerly the last two years of the primary school and the first two of the secondary school. For admission to a preparatory school a pupil must be between ten and twelve years old and must have passed an examination given him on completion of the primary-school curriculum.

Pupils who have received a preparatory-school certificate are channeled into either academic or technical secondary schools. The course in both is for three years. The holder of a certificate from an academic school is eligible for university matriculation. For their last year in the academic secondary school the pupils are grouped according to whichever of three fields, literature, science, or mathematics, they have shown the greatest ability. They are then given special instruction in preparing themselves for university work in that field.

The greatest development in secondary education has taken place since World War II. The extent of this development is indicated by the reported enrollment of 415,761 pupils in 595 secondary schools in 1954-1955 as compared with only 93,433 in 289 schools in 1950.

Only students with academic secondary-school certificates are permitted to go on to the universities. The technical secondary schools, which have offered training in the various branches of agriculture, industry, and trade since the 1930's, have never attracted many pupils. Their goal is to prepare their pupils for employment as foremen and other skilled supervisors, and the wages paid for this type of employment are generally low. In 1954 there were only 85 technical secondary schools and their total enrollment was only 26,680. That tuition in these schools, as in the academic secondary schools, was not abolished until 1950 is also responsible for the slow increase in their attendance.

Government Control of Public Education

Government control is rigorously exercised over all schools up to the university level, except for the El Azher institutes. The teachers are civil servants and their appointments, salaries, and promotions are regulated by standard requirements and scales like those of any other government employees. The curricula are prescribed by the Ministry of Education and are standardized throughout the country. The Ministry

grants the primary, preparatory, and secondary-school certificates and holds the examinations on which they are based. The courses for each grade are fixed and compulsory and all run for the whole school year. The examination system is extremely rigid. Not only is a pupil's work in any course judged entirely by the marks he gets on an examination given him at the end of the year, but if he fails in a single subject, he must take the whole year over again, with all its fixed courses, unless he passes a supplementary examination given at the end of the summer before the new term begins.

The overcrowding of the curriculum and the disproportionate amount of time devoted to foreign languages are other important concerns of critics of the school system. In the secondary schools as many as sixteen subjects may be studied concurrently and recited on daily. In the primary and secondary schools between 40 and 50 per cent of the time is devoted to the study of Arabic, and to English or French or both. Moreover, classical Arabic, which is still the written language of Egypt, differs so greatly from the colloquial regional dialects spoken by all classes as to be almost a foreign tongue. [14]

The Universities

El Azher.

Egypt's oldest university is El Azher, centered around the mosque of El Azher in the medieval quarter of Cairo. Founded in 970 A.D., El Azher has been recognized for centuries as the world's chief center of Islamic and Arabic learning, and as such draws students from all parts of the Moslem world. (In the academic year 1953-1954, there were 4106 foreigners out of a total enrollment of 30,789.) Its library of Arabic literature is without rival. Although it still specializes in theological studies, Islamic jurisprudence, and the Arabic language, it has been considerably reorganized in recent years, and now has a well-equipped General Section, housed in modern buildings. This is concerned chiefly with the social sciences but offers courses and laboratory work in the natural sciences as well. The present government has introduced physical and military training.

Preparation for El Azher is provided in its own primary and secondary institutes, which are well distributed throughout the country. The university and its preparatory institutes are open only to men, but plans are now under way for organizing classes for women. El Azher is a state university completely supported by the government, but it has its own administration and is independent of the Ministry of Education. Hostels are provided for a considerable portion of the student body and a new El Azher University City is to be inaugurated at the university's millennial celebration.

Cairo University.

College education along modern lines began in Egypt in 1908 with the founding at El Giza of schools of Medicine and Law and a College of Higher Training. This group of institutions, all of which were established by private financing under the auspices of Prince Fouad (later King Fouad I), was called, collectively, The Egyptian University, although there was no single

administrative organization for the group as a whole. In 1925 the five existing faculties - Arts, Science, Medicine, Law, and Pharmacy - were reorganized as a state university. Faculties of Engineering, Agriculture, Veterinary Science, and Commerce were added in 1935 and other faculties since then. A number of institutes have also been established in affiliation with the University. It now consists of ten faculties and eight institutes with a total of 21, 541 students in the academic year 1953-1954.

The original name, The Egyptian University, was changed to Fouad I University in 1942, and to Cairo University in 1954. Free tuition and scholarships are provided on a generous scale. About 71 per cent of the students attend tuition-free, and in some of the departments the proportion is as high as 91 per cent. The General Students' Union also arranged subventions for needy students from a University Fund for Social Services.[15]

Other State Universities and Training Schools.

Founded in Alexandria in 1942, Farouk University was renamed Alexandria University after the *coup d'état* of 1952. This university now has eight faculties and four affiliated institutes. The student enrollment in the 1953-1954 academic year was 8961. Plans are under way for a University City to be built in collaboration with the Ministry of Wakfs, on land belonging to the Ministry.

A third university, Ibrahim Pasha University, founded in 1950, has headquarters at Heliopolis, the suburb northeast of Cairo, but has departments at various locations in the city. Built to relieve pressure at Cairo University, it had an enrollment of 16, 039 in its eight faculties and two institutes in the academic year 1953-1954, and was second in size of the three secular state universities. Its institutes - a Higher Institute for Men Teachers and a corresponding organization for the training of women - provide the only university training offered for teachers. Its name was changed in 1954 to Ein Shams (Arabic: Heliopolis).

Girls and Women in the Educational System

There is no co-educational schooling below the university level, not even at the institutes for teacher training. While male teachers are permitted in both boys' and girls' schools, women teachers are permitted in girls' school only. Female pupils are very much in the minority in all stages of the educational system. At present they constitute about 35 per cent of the enrollment in the primary schools, 15 per cent in the secondary schools, and 10 per cent in the universities and higher institutes. However, since the 1920's female enrollment in all school categories has increased greatly; in the school year 1953-1954 there were 558, 800 girls in primary schools, as compared with only about 5000 in the elementary and primary schools in 1920, and 93, 000 in the preparatory and secondary schools as compared with only 28 in secondary schools in 1920. Women were enrolled in all the university departments in the academic year 1954-1955 - 6766 out of a total of 55, 051 students in the three universities.

Specialized Educational Institutions and Adult Education

Teacher training and instruction in the arts are provided in a number of institutes under the direction of the Ministry of Education. Other specialized government schools are the Police Academy and the Constable School, under the Ministry of Interior; the Military Academy, with its affiliated Navy and Aviation School; a Military Secondary School; and a Military Mechanical Industries School.

Some instruction is available for adults lacking secondary-school education, or desiring specialized training or further study in general cultural subjects. An Institute of Popular Culture was established in Cairo and Alexandria in 1940. By 1953 there were eighteen such centers in the valley and delta, with a total reported enrollment for the academic year 1953-1954 of 11,634 men and 6562 women. The only qualifications for enrollment are that the applicant must be over sixteen years of age and able to read and write.

The courses vary considerably from center to center, but the general plan is to provide instruction in the fine arts, commercial subjects and typewriting, elementary technical and mechanical training, and especially for women, courses in domestic science; sewing, nursing, and child care. At several of the centers training in handicrafts is given for the blind. Journalism is offered at Cairo, Alexandria, and Asyut, and library technique at the Cairo center. Cultural courses include such subjects as history, Arabic literature, political science, hygiene, and social service. Night as well as day classes are scheduled at most of the centers.

POPULATION CHARACTERISTICS

Size and Density

The 1947 decennial census of Egypt[16] enumerated the total population as 19,021,840. Many think that this figure is too high,[17] but on the other hand, the population by now (1958) has grown to about 24,000,000. For[18] lack of any acceptable correction factors or later data, the 1947 census figures are used in this chapter, with comment on possible inaccuracy where necessary.[19]

Egypt proper - the Nile valley and delta and the Suez Canal Zone - is one of the most densely populated regions of its size in the world. On 13,443 square miles (34,815 square kilometers), 18,805,826 people were living in 1947,[20] giving an overall density (rural and urban population combined) of 1399 per square mile (540 per square kilometer). Even excluding the governorates of Cairo, Alexandria, Damietta, Suez Canal, and Suez, the greater part of whose population is urban, the overall density of the "rural" provinces is 1184 per square mile - 996 in the delta and 1508 in the valley. It will be seen from Table 4 that none of

Table 4 - Population by Provinces, 1947

DELTA	Area in Square miles	Population Total	Population Per square mile	Population outside towns of over 25,000 Total	Population outside towns of over 25,000 Density
Beheira	1,638.5	1,244,495	757	1,101,552	671
Daqahliya	1,024.3	1,413,905	1,379	1,228,557	1,189
Gharbiya	2,711.8	2,327,031	858	2,009,272	748
Minufiya	613.1	1,165,015	1,900	1,091,904	1,779
Qalubiya	365.0	693,908	1,901	628,263	1,720
Sharqiya	1,868.5	1,345,829	713	1,264,016	676
Total	8,221.2	8,190,183	996	7,323,554	890
VALLEY					
Aswan	362.7	290,842	802	199,072	548
Asyut	810.2	1,374,454	1,696	1,248,727	1,541
Beni Suef	422.3	612,027	1,426	554,921	1,314
Faiyum	670.5	669,696	999	570,297	850
Girga	605.5	1,283,468	2,119	1,094,613	1,807
Giza	409.3	818,168	1,999	752,012	1,837
Minya	782.3	1,044,201	1,334	973,903	1,242
Qena	708.3	1,106,302	1,562	1,010,105	1,424
Total	4,771.1	7,199,158	1,508	6,403,650	1,359

Note: Population of Governorates, Frontier Provinces, and nomads not included.

Table 5 - Size of Villages, Towns, and Cities (Valley, Delta, and Canal Zone), 1947

Population categories	No. of settlements	Population	Percentage of total
	Cairo	2, 090, 654	11. 2
	Alexandria	919, 024	4. 88
100, 000 - 200, 000	5	642, 596	3. 41
50, 000 - 100, 000	9	645, 330	3. 43
25, 000 - 50, 000	26	842, 455	4. 48
20, 000 - 25, 000	18	404, 117	2. 15
10, 000 - 20, 000	157	2, 097, 196	11. 15
5, 000 - 10, 000	346		
2, 500 - 5, 000	955		
1, 000 - 2, 500	2, 043	11, 164, 454	59. 36
500 - 1, 000	2, 021		
200 - 500	4, 407		
Less than 200	16, 242		
Totals	26, 229	18, 805, 826	100. 0

the valley provinces has a density of less than 800 per square mile and that Girga, with a density of 2118, is the most heavily populated province in the country.

The greater density of the valley as a whole, even though it has fewer large towns, reflects the fact that the delta has large tracts of uncultivated lands. In the northern provinces of the delta extensive coastal areas are not yet under cultivation for lack of adequate drainage, while the delta's border provinces include considerable areas that are only sparsely settled because of the sandy soil and lack of sufficient Nile water to provide canal irrigation.

Rural and Urban Distribution

No precise breakdown of Egypt's rural and urban population can be derived from the 1947 census reports, which give the population only by hamlets, villages, towns, and cities. The agricultural population lives almost exclusively in the hamlets and villages, for many of which it would be impossible, without first-hand information village by village, to estimate what proportion of their inhabitants can be properly classed as rural.

Of 26,229 cities, towns, villages, and hamlets reported in the valley, delta, and Canal Zone in the 1947 census, 16,242 had less than 200 inhabitants each and another 6428 had only between 200 and 1000 (see Table 5). Presumably all but a very small number of the residents of the villages in both these categories should be classed as rural. More than 11,000,000 persons, or 56 per cent of the total population of the country, live in the 26,014 towns, villages, and hamlets in the category of less than 10,000 inhabitants. Estimates of the rural population based on the number of persons given in the 1947 census as making their living by agriculture place it, however, at close to 70 per cent of the total.[21]

For a country whose economy is so dependent on its agricultural production, the number of large towns is surprisingly great. As shown in Table 5,[22] 27 per cent of the population of the valley, delta, and Suez Canal Zone lived in the country's forty-two cities and towns of over 25,000 inhabitants - 16 per cent in Cairo and Alexandria, 3.4 in the other five cities with over 100,000 inhabitants, 3.2 in the nine cities with between 50,000 and 100,000, and 4.4 in the twenty-six towns with between 25,000 and 50,000.

Table 6 - Population of Urban Centers with over 25,000 Inhabitants, 1947

Urban center	Province or Governorate	Population	Urban center	Province or Governorate	Population
Cairo	Cairo	2,090,654	Tahta	Girga	37,095
Alexandria	Alexandria	919,024	Benha	Qalubiya	35,880
Port Sa'id	Suez Canal	177,703	Mallawi	Asyut	35,624
Tanta	Gharbiya	139,926	Akhmim	Girga	34,788
Mahalla el Kubra	Gharbiya	115,758	Bilqas	Gharbiya	34,771
Suez	Suez	107,244	Girga	Girga	33,631
El Mansura	Daqahliya	101,965	Minuf	Minufiya	31,475
Asyut	Asyut	90,103	Disuq	Fouadiya	31,334
Damanhur	Beheira	84,352	Idku	Beheira	30,033
Zaqaziq	Sharquiya	81,813	Qalub	Qalubiya	30,021
Faiyum	Faiyum	73,642	Matariya	Daqahliya	29,705
Minya	Minya	70,298	Mit Ghamr	Daqahliya	29,030
Ismailiya	Suez Canal	68,229	Biyala	Fouadiya	28,757
Giza	Giza	66,156	Rosetta	Beheira	28,558
Beni Suef	Beni Suef	57,106	Luxor	Qena	27,457
Damietta	Damietta	53,631	Zifta	Gharbiya	27,404
Sohag	Girga	43,168	Aswan	Aswan	26,343
Qena	Qena	42,929	Idfu	Aswan	26,192
Shibin el Kom	Minufiya	41,636	Isna	Qena	25,811
Giheina	Girga	40,173	Sinnuris	Faiyum	25,757
Kom Ombo	Aswan	39,235	Simbillawein	Daqahliya	25,648

Sex and Age Structure

According to the 1947 census report, the females in the population only slightly exceeded the males, with 9,391,728 males and 9,575,039 females enumerated, exclusive of the nomad population. Only in the age group under fifteen years were more males than females enumerated; there the ratio was 1010 males to 1000 females. In the over-fifty-five group it was 1153 females to a 1000 males.

As can be seen from Table 7,[23] the population of Egypt is youthful. The census of 1947 reported that of the persons giving their ages 48.1 per cent were under 20 years of age and 83 per cent under 45 years as compared to 34.2 and 71.5 per cent, respectively, reported in the United States census of 1950. Only 14.6 per cent were between 45 and 70 years of age and only 2.3 per cent over 70 as compared to 23.6 and 4.8 in the United States. The great majority of Egyptians do not live to the age of 50. The most recent estimates of life expectancy at birth, those for the period 1936-1938, are 35.65 years for males and 41.48 for females. The decrease in the death rate since 1947, as officially reported, would slightly increase these figures, but the life expectancy would still be one of the lowest among the countries for which such estimates are available.

Table 7 - Percentage Distribution of Population by Age Groups

(Egypt and Selected Countries)

Age groups	Egypt (1947)	U.S.A. (1950)	England and Wales (1950)	France (1950)	Sweden (1949)	Japan (1950)
Under 5	13.7	10.8	8.5	9.4	9.1	13.5
5 - 9	12.7	8.8	7.2	5.8	7.7	11.5
10 - 19	21.7	14.6	12.7	13.9	12.3	28.8
20 - 29	15.1	15.5	14.1	15.9	14.8	16.7
30 - 44	19.8	21.5	22.4	19.2	23.1	17.7
45 - 54	10.8	16.3	19.2	19.3	18.3	12.2
55 - 69	3.8	7.3	9.1	9.2	8.5	4.9
70 and over	2.3	5.1	6.8	7.5	6.3	2.9
Not stated	0.3	-	-	-	-	-

Fertility

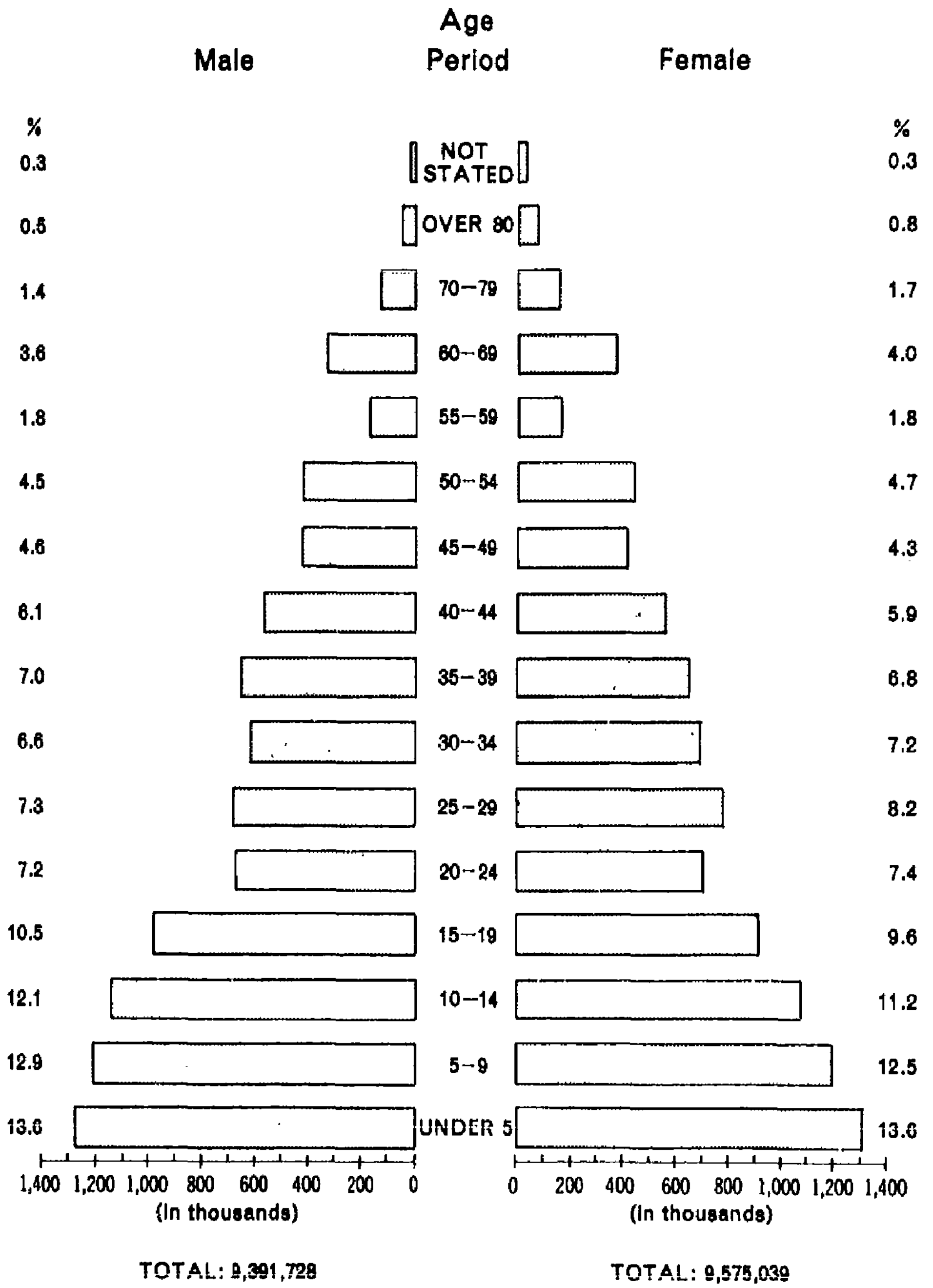
Thirty-five per cent of the total population of Egypt is in the age group of 20-45 years and nearly 45 per cent of the total female population is of child-bearing age. This implies a population of high reproduction potentiality, and the implication is borne out by the official birth-rate figures (see Table 8). Demographers familiar with the

Table 8 - Live Birth Rates, Crude Death Rates, and Increase Rates Per 1000 Population, and Infant Mortality Per 1000 Births

Year	Births	Deaths	Increase	Infant Mortality
1920	42.2	28.0	14.2	137
1925	43.5	26.5	17.0	155
1930	45.4	24.9	20.5	151
1935	41.3	26.4	14.9	161
1940	41.3	26.3	15.0	162
1942	37.6	28.3	9.4	168
1943	38.7	27.7	11.1	160
1944	39.8	26.0	13.8	157
1945	42.5	27.7	15.0	153
1947	43.8	21.4	22.3	127
1949	41.8	20.6	21.1	135
1950	44.0	19.0	25.0	135

inaccuracy and incompleteness of birth and death reporting in backward countries, and particularly in impoverished rural communities such as those which predominate in Egypt, are inclined to think that the annual numbers of births and deaths there are both considerably greater than reported. Wendell Cleland found, from an examination of the birth re cords over a period of twenty-eight years, that the birth rate in areas

AGE AND SEX COMPOSITION OF POPULATION—1947



with Health Bureaus was at all times substantially higher than reported for Egypt as a whole. [24] At that, the reported birth rate for the country - an average of over 40 per thousand annually for the period 1920-1951, except for the years 1942-1944, when it fell to an average of 38.7 per thousand - is one of the highest in the world.

Table 9 - Vital Statistics Rates per Thousand, 1949*

(Egypt and Selected Countries)

Country	Births	Deaths	Increase	Infant Mortality	Marriages	Divorces
Egypt	41.8	20.6	21.1	135.0	14.1	3.7
U.S.A.	24.0	9.7	14.3	31.3	10.6	2.7
United Kingdom	17.0	11.7	5.3	34.1	8.5	0.8
France	20.9	13.7	7.2	60.2	8.2	0.9
Sweden	17.4	10.0	7.4	23.3	7.9	1.1
Japan	32.8	11.6	21.2	62.5	10.3	-
Mexico	44.7	17.7	27.2	106.6	5.7	0.3

*From Demographic Yearbook, Statistical Office, Department of Economic Affairs, United Nations, 1952.

This high birth rate is to be attributed to a number of factors, religious, social, and economic. To Copts, as well as to Moslems, children are a gift from God, and any measure taken to limit their number is considered an act of impiety. Early marriage is practically obligatory among the Moslems, and among the rural Copts, who generally imitate the social customs of the Moslems, it is also the rule. There is now, however, a trend away from early marriage for women among the Moslems. The legal marriage age was raised in 1923 to sixteen years for women and eighteen for men. Although the 1947 census reported that only 11.4 per cent of the total number of women over sixteen years of age had never been married, nearly 50 per cent of the unmarried women were between sixteen and eighteen years of age.

To the Moslem woman children afford a measure of security against divorce. Children are a man's greatest pride in Egypt, but in case of divorce it is traditional for the children to remain with the mother; but it is Islamic law that a divorced father must contribute, according to his means, to the support of the children he leaves. On the other hand, the ease with which a Moslem husband may divorce his wife and the frequency

Table 10 - Deaths by Age Groups in All Communities with Health Bureaus, 1949

Age	Number	Percentage of total	Age	Number	Percentage of total
Under 1	64,914	34.6	40-50	5,703	3.0
1-2	33,998	18.1	50-60	6,555	3.5
2-5	22,289	12.1	60-70	8,594	4.6
5-10	3,939	2.1	70-80	9,384	5.0
10-20	5,098	2.8	80-90	7,520	4.0
20-30	5,830	3.1	Over 90	7,140	3.8
30-40	6,099	3.3			

Official statistics on the causes of death are published only for the communities with Health Bureaus, presumably in recognition of the probable inaccuracy of diagnoses elsewhere. Major causes of the deaths reported in these communities for 1949 are given in Table 11.[25] Diarrhea, enteritis and "congenital debility" in infants of under one year accounted for 30.3 per cent of the total deaths. These causes were responsible for 54 and 33 per cent, respectively, of all deaths of infants in this group. After these diseases of childhood, bronchitis and pneumonia were the greatest killers. The death toll from these two diseases was high throughout the year (during no month was it less than 4.5 per cent of the total for the year), but the greatest incidence was during the winter months from December to March. On the other hand, 45 per cent of the total number of deaths from all causes occurred during the summer months of May, June, July, and August - the season of the Nile flood.

of divorce and remarriage of the divorced men with younger women undoubtedly contribute to the high birth rate. The birth rate among Moslem Egyptians is somewhat higher than among the Copts, to whom divorce is a violation of sacred law.

A large family is looked upon as insurance that the parents will be cared for in their old age. To the Egyptian farmer, moreover, children as children are an economic asset. Each child is an added hand for the intensive cultivation of crops. This is particularly the case with the cotton farmer, who finds much work for his children to do at an early age - planting the seed, ridding the plants of insect pests, and even picking the ripe bolls.

In the large urban centers and particularly in governorate cities, however, the birth rate is reported to be much higher than the national average; in 1949 it was 57 per thousand in Suez, 50.5 in Alexandria, 49.9 in Port Sa'id, 47.9 in Cairo, and 47.4 in Damietta. These higher rates are due to the presence in all of these cities of Health Bureaus, one function of which is careful attention to the registration of vital statistics.

MORTALITY

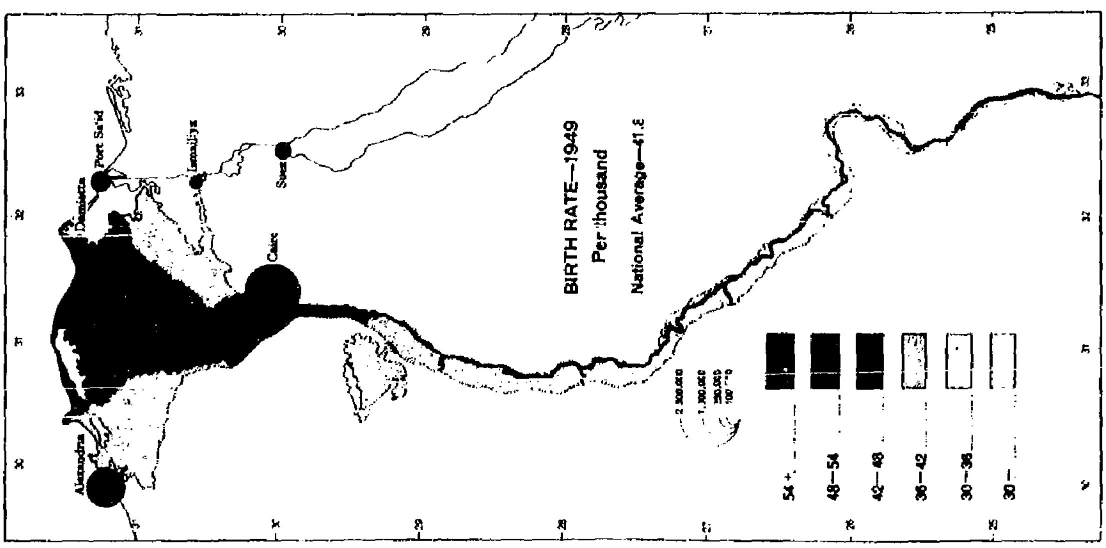
The death rate in Egypt is extremely high. Table 8 shows it averaged well over 25 per thousand annually in the period 1920-1945. However, since the late 1940's it has declined considerably; in 1949 it was down to 20.6 and in 1951 to 19. But it is still more than twice as high, for example, than the rate in the United States (9.7 per thousand in 1951).

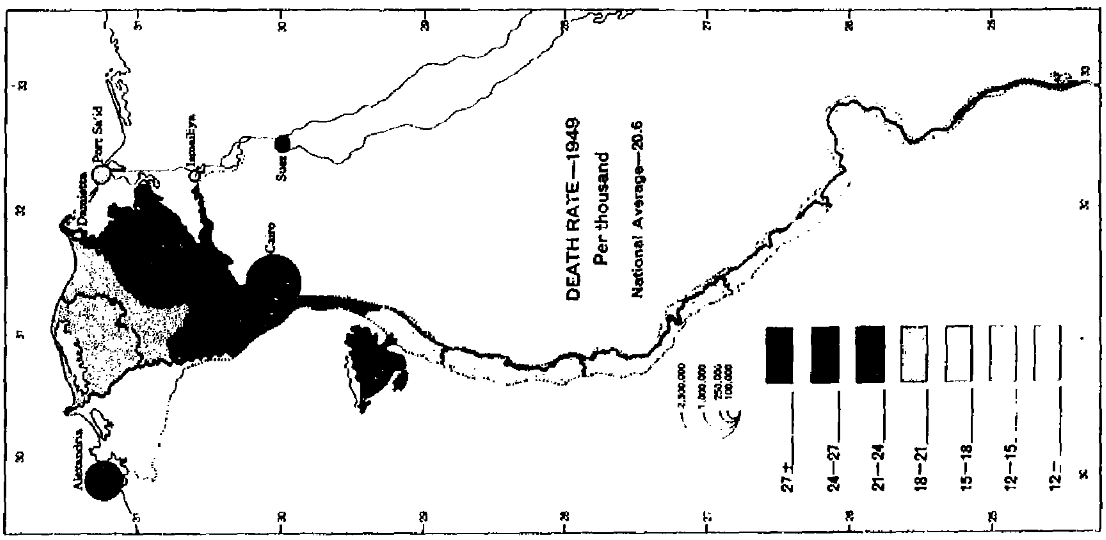
A major component of the high death rate is the exceptionally high mortality among infants less than one year of age. For the thirty-year period 1920-1949, infant mortality accounted for about one-fourth of the average annual death total and averaged 153 per thousand live births. This is three or four times the rate in the western European countries and in the United States and Canada. The recent decline in the total death rate partly reflects a drop in the infant mortality rate to 135 per thousand live births in 1949 and 1950. But deaths of infants under one year of age still accounted for more than a fourth of the total deaths reported for 1949 - 112,641 out of a total of 410,524. In the communities served by Health Bureaus, where statistics are more accurate than elsewhere, out of a total of 187,049 deaths recorded, 34.6 per cent were of infants under one year of age (see Table 10) as compared to 27.4 per cent reported for the country as a whole.

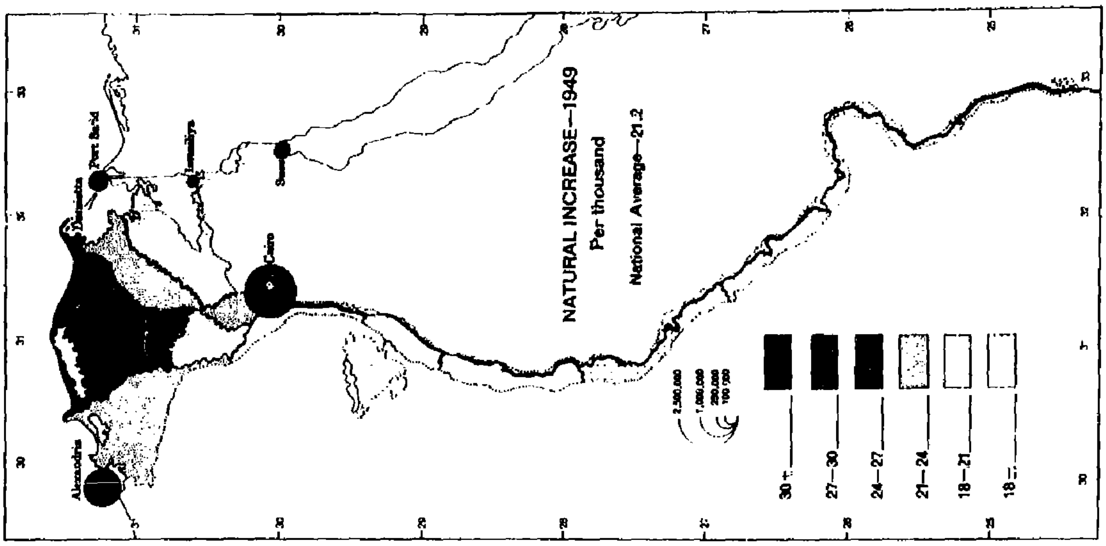
Table 11 - Major Causes of Death in All communities with Health Bureaus

(Percentage of Total Deaths, 1949)

Causes	Percentage of total
Diarrhea and enteritis	
Under 1 year	18.7
1-2 years	13.0
2-10 years	6.5
Over 10 years	0.5
Bronchitis and pneumonia	13.0
Congenital debility (under 1 year)	11.6
Old age (over 65)	10.5
Heart diseases	2.5
Accidents	2.4
Nephritis	2.3
Tuberculosis (all forms)	2.0
Cerebral hemorrhage	1.5
Measles	1.2
Arterial disease	1.1
Asthma	0.9
Cancer	0.8
Avitaminosis (mainly rickets and pellagra)	0.8
Typhoid and paratyphoid	0.5
Anemia	0.5
Diabetes	0.4


BIRTH RATE—1949
Per thousand
National Average—41.8
Alexandria
Damietta
Port Said
Ismailiya
Suez
Cairo
54+
48—54
42—48
36—42
30—36
30—


DEATH RATE—1949
Per thousand
National Average—20.6
Alexandria
Damietta
Port Said
Ismailiya
Suez
Cairo
27+
24—27
21—24
18—21
15—18
12—15
12—


NATURAL INCREASE—1949
Per thousand
National Average—21.2
Alexandria
Damietta
Port Said
Ismailiya
Suez
Cairo
30+
27—30
24—27
21—24
18—21
18—

Marriage and Divorce

Of the 11,265,000 persons over sixteen years of age, 7,407,000, or 65.7 per cent, were married when the 1947 census was taken (see Table 12); 1,269,000, or 11.1 per cent, were widowed and not remarried; and 197,000, or 1.1 per cent, were divorced and not remarried. The average number of marriages contracted yearly in the period 1942-1951 was 272,000, or 14.3 per thousand of the population. (The rate in the United States in 1951, a high year, was 13.9.) The average annual number of divorces during this period was 75,000, which comes to 24.6 per cent of the marriages. The divorce rate is much higher in the urban centers than in the rural areas.

Table 12 - Marital Status, 1947
(In thousands and percentages of total over 16 years)

Status	Males		Females		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Married	3,641	66.4	3,766	65.1	7,407	65.7
Divorced	70	1.3	127	2.2	197	1.7
Widowed	138	2.5	1,131	19.6	1,269	11.1
Never married	1,514	27.6	662	11.4	2,176	19.5
Not stated	119	2.2	97	1.7	216	2.0
Totals	5,482	100.0	5,783	100.0	11,265	100.0

Table 13 - Married Women by Duration of Present Marriage, 1947

Duration	Number	Percentage	Duration	Number	Percentage
Under 5 years	819,343	21.8	30-34	183,410	4.9
5-9	656,939	17.4	35-39	70,901	1.9
10-14	528,905	14.1	40-44	63,281	1.7
15-19	431,867	11.4	45 and over	36,458	1.0
20-24	377,165	10.0	Not stated	380,759	10.1
25-29	216,531	5.7			

Total number of married women (1947) 3,765,559

Divorce is most frequent among the Moslems and Jews. For the year 1947 the rate was 28.4 per thousand married persons among the Moslems, 20.9 among the Jewish population, and only 4.5 among the Christians. Divorce is so easy a matter for the husband under Islamic law that until recently it was looked upon rather as a right to be exercised at his pleasure. Nevertheless, 40 per cent of the women who reported the duration of their present marriage had been wed for fifteen years or more and nearly 20 per cent 20-25 years or more. Divorce regulations have recently been somewhat tightened with a view to suppressing misuse of the "privilege."

Islamic law permits a man to have as many as four wives at one time. Polygamy, however, was never very widely practiced by the people of Egypt as a whole, except among the uneducated of the lower middle class. Indeed, in general it is now frowned upon. The 1947 census reported 96.4 per cent of the 3,328,612 Moslem husbands had only one wife (see Table 14).

Table 14 - Moslem Husbands Classified by Number of Wives, 1947

No. of wives	No. of husbands	Percentage of total
1	3, 209, 405	96.4
2	111, 746	3.4
3	6, 573	0.2
4	888	0.0

Polygamy has always been practiced mainly in the urban centers. Among the farmers it has been rare, partly because it has no roots in their tradition and partly because of their limited means; the Koran specifies that a man may take more than one wife only if he is able to support more than one.

OCCUPATIONAL STRUCTURE

Agricultural Population

Agriculture is the predominant occupation of the Egyptian people. As may be calculated from Table 15, of 6, 736, 427 persons who listed regular occupations in the 1947 census, 63 per cent were engaged in agriculture. Actually a total of 7, 497, 964 were registered as so engaged, but of these 3, 349, 687 (3, 335, 194 women and 14, 493 men) were farmers' wives, other relatives, or domestic servants in farm households. This total adult farm population with its dependents constituted about 70 per cent of the population of the country.

Of the persons engaged in agriculture, 2, 760, 742 were reported in 1950 as owning land (see Chapter 7, Land Ownership and Tenure). However, 1, 981, 346 of these owned no more than one feddan (1. 038 acres), and many owned much less, since the average area owned amounted to less than half a feddan.

Table 15 - Occupational Structure, 1947

Occupation	Total	Men	Women
Agriculture	4,147,086	3,585,334	561,752
Manufacturing and handicraft	666,703	611,254	55,449
Commerce and trade	553,271	493,496	59,775
Transportation and communication	200,490	198,655	1,835
Construction and maintenance	113,361	112,414	947
Fishing	55,645	54,586	1,059
Irrigation and water supply	41,990	39,236	2,754
Finance	31,663	30,514	1,149
Mining and quarrying	18,088	17,922	166
Power, light and heat	3,702	3,647	55
Miscellaneous agencies	5,446	5,188	258
Personal service	373,316	229,656	143,660
Professional services			
Education	55,513	46,279	9,234
Religion	52,334	50,088	2,246
Medicine	29,172	20,718	9,868
Law	22,980	22,699	281
Government services	313,485	308,767	4,718
Entertainment and sport	11,130	9,989	1,141
Authors, publishers, artists	3,310	1,929	1,381
Museums, libraries, etc.	1,141	1,123	18
Ill defined, part-time, etc.	36,601	35,988	613
Total	6,736,427	5,878,068	858,359

The great majority of owners in the less-than-one feddan category, as well as many others, have to supplement their incomes by cultivating additional rented land or working as laborers on larger holdings. The 1947 census reported 106,964 as cultivating both their own and rented land, but did not indicate how many owners also work as laborers on other farms. There were 681,559 landless persons who rented land and 1,391,988 landless farm laborers.

Industrial Population

Egypt's industrial population is taken here to include those who derive their livelihood from manufacturing (including handicrafts), mining and quarrying, the generating and supplying of electrical power, oil refining, construction and maintenance, operation of the irrigation and other water-supply systems, transport and communication, and commerce, trade, and finance. Fishing is generally included under agriculture in Egyptian statistics, but is included here as an industrial occupation, since the great majority of the professional fishermen do no farming.

In addition to the enumeration of the population by occupation included in the regular decennial censuses, industrial censuses were taken in 1945, 1948, and 1951. The report, on these censuses, however, [26] deals with only 19,495 manufacturing establishments and 32 mining and quarrying operations employing a total of only 307,443 persons in 1951, and does not concern the many other activities classed here as industrial. It takes little cognizance of the numerous handicraft shops which play so important a part in the manufacturing industry in Egypt and none at all of the many home craftsmen.

According to the 1947 census report, the total number of persons engaged in some branch of industry was 1,684,913 (1,561,724 males and 123,189 females), or nearly 9 per cent of the total occupied population. With their 3,650,961 declared dependents, they accounted for 28 per cent of the population of the country.

Employment Status.

Of those who specified their occupations, only 14,283 males and 176 females reported themselves unemployed on the day the 1947 census was taken. The actual number of unemployed was considerably greater, however. Some estimates place the number of unemployed at between 100,000 and 200,000 in recent years. [27] When the British and American military forces departed after World War II, they left temporarily out of employment a labor force estimated at between 250,000 and 300,000 whom they had recruited for various services. The expansion of manufacturing took care of many of the unemployed, however, and many others returned to the rural villages they had been recruited from.

Underemployment is perhaps as serious a problem as unemployment. Many Egyptian industries operate only seasonally or part time. This is particularly the case with such important industries as cotton ginning and shipping, food processing, construction work, millwork, and joinery. Even rail and river transport is more or less seasonal, since it is largely dependent on cargoes of agricultural produce. It may be assumed that most workers in such industries did not report themselves as unemployed, even though they had no work at their regular occupations at the time the census was taken.

Women and Children in Industry.

Between 1937 and 1947, the number of males in industry increased by about 38 per cent and of females by 13 per cent, while the total

population increased by only 13 per cent. In other words, females in industry have not kept pace with the males; women constituted 8.7 per cent of the industrial population in 1937, but only a little more than 7 per cent in 1947. This trend reflects a general curtailment of opportunities for employment, rather than any increase of prejudice against women workers; there was simply little need to draw on the female population. A 1933 labor law prohibits night work for women and children and forbids their employment in certain industries considered dangerous or unhealthy for them, and this has acted to some extent as a deterrent against both women and children.

The number of children working in industry is nevertheless still large. In 1947, 99,711 persons under fifteen years of age (89,762 boys and 9949 girls), nearly 6 per thousand of the total, were engaged in industry. The law permits children of even less than nine years of age to be employed in certain industries, but it restricts their work to a limited number of hours (not more than seven a day, including school hours), while those between nine and fifteen years of age cannot be employed for more than nine hours a day.

The Manufacturing Population

The 1947 census reported 666,703 persons, or about 60 per cent of the industrial population, as occupied in some branch of manufacturing (see Table 16). Of these, 31,883 (29,907 men and 1982 women) were employers or managers, 201,177 (171,727 men and 29,450 women) were own-account workers engaged in home industries or operating small workshops with little, if any, hired help, and 413,096 were employees. Of the last, 7601 reported themselves as out of work when the census was taken, and 20,089 as apprentices. Only 458 were listed as supervisors or foremen - an indication of the extent to which all but the largest factories and mills are owner operated and supervised.

Size of Establishments.

As shown in Table 17, nearly 70 per cent of the 26,110 manufacturing establishments reported in 1947 employed less than five persons. But this figure relates only to establishments using some sort of mechanical equipment, and takes no account of the thousands of handicraft shops and home industries. These small establishments are most numerous in the manufacture of textiles (10,615 in 1947), processed food (2144), clothing (1546), and furniture (1127). Many of the large establishments - those with a hundred or more employees - also engage in food processing and textiles (55 and 72 establishments, respectively, out of a total of 301).

Construction and Maintainance.

Of the 113,361 persons in construction and maintenance work, 76,790, or 67 per cent, gave their occupation as house or other building construction. Much unemployment might be expected in this field, but in the 1947 census only 1668 persons declared themselves out of work. If the present program for school construction and industrial development is carried out, and particularly if the proposed High Dam above the present Aswan Dam is built (see Chapter 5, Irrigation), the demand for both skilled and unskilled construction workers will increase considerably.

The remainder of the construction workers were engaged principally in government service - in building and maintaining roads and railroads and in the development and maintenance of the irrigation and drainage systems. Of 36,571 persons in such work in 1947, only 77 declared themselves as unemployed - evidence that they constitute a fairly permanent staff.

Mining and Quarrying.

Mining affords little employment in Egypt. Of 5123 miners in 1947, nearly 80 per cent were engaged in petroleum extraction and the mining of nonmetallic minerals (mainly salt, soda, and phosphate) - 2817 and 1278 respectively. Only 977 were occupied in mining metallic ores, most of them at the manganese mines in Sinai and at Hamata in the southern part of the Eastern Desert.

Although iron ore is the ore mineral of which Egypt is known to have substantial deposits (see Chapter 8, Raw Materials and Mining), only 22 persons were reported in the 1947 census as working these deposits. They have never been exploited on a large scale because of their great distance from the country's major industrial centers (the largest and richest are near Aswan)and because of the lack of cheap power and fuel. What little iron mining is done at present is to extract chrome iron for use in the manufacture of pigments. But in the forefront of present plans for industrial development is the establishment of iron and steel works at Helwan, near Cairo. The contract calls for a plant of sufficient production capacity to supply all of the country's anticipated needs for many years to come. The Aswan deposits will furnish the iron ore, and the generators now being installed in the Aswan Dam are to supply the power, but the coke will have to be imported. If carried out, this plan will create a new field of employment of major proportions, but so many interdependent enterprises are involved that it will be many years before it can make the expected contribution to the economy of the country.

Quarrying, on the other hand, is a fairly important industry. The 1947 census reported 7630 persons engaged in quarrying building stone (mainly granite and limestone) and 212 working sand, gravel, and clay pits. The latter figure is small (although Egypt produces practically all of its requirements for cement and brick building materials) because so much mechanical equipment is used in the beds, southwest of Cairo, which yield most of the raw material.

Irrigation and Water Supply.

The number of persons engaged in irrigation operations seems small for so elaborate a system - a total of only 41,990, and of these nearly a fourth were operators of privately-owned pumping systems. Heaviest employment on the government-owned system occurs during January, when the flow of water in the canals is halted for their annual clearing and repair, for which farm labor is recruited.

Table 16 - Persons Occupied in Various Manufacturing Industries, 1947

Industry	Total	Male	Female
Manufacture of textiles, clothing, etc.			
Textiles	157,445	140,360	17,085
Clothing	128,919	112,527	16,392
Other textile goods	10,530	9,426	1,104
Leather and fur	9,926	9,736	190
Rubber goods	693	671	22
Foods, beverages, etc.			
Grain milling	17,427	17,177	250
Sugar refining	11,100	11,026	74
Other food processing	101,101	97,424	3,677
Tobacco	5,570	5,486	84
Beverages	4,212	4,131	81
Metal industries			
Founding, smelting, etc.	28,283	27,958	325
Miscellaneous metal articles	43,709	43,061	648
Machinery and repair	36,949	36,613	336
Wood products			
Basketry	16,952	4,545	12,407
Furniture	5,928	5,547	381
Millwork and joinery	1,677	1,670	7
Pulp and paper	1,385	1,323	62
Miscellaneous	490	344	146
Vehicles, boats, and their repair			
Automobiles and motorcycles	14,285	14,128	157
Railway rolling stock	8,675	8,642	33
Boats and ships	3,929	3,909	20
Miscellaneous	3,129	3,100	29
Fine handicrafts			
Ceramics and glass	9,467	8,741	726
Jewelry, gold and silver work	6,112	6,066	46
Scientific instruments, clocks, etc.	4,482	4,371	111
Chemical industries			
Soap	1,999	1,969	30
Colors, paint, ink	1,068	1,045	23
Miscellaneous	1,415	1,357	58
Miscellaneous			
Graphic industries	13,096	12,944	152
Earthen building materials	11,367	10,798	569
Mineral fuel refining	1,017	985	32
Other	4,366	4,174	192
Total	666,703	611,254	55,449

Table 17 - Size of Manufacturing Establishments

by Number of Employees, 1947

Establishments	Number of Employees	Establishments	Number of Employees
18, 118	Less than 5	265	50 - 99
5, 226	5 - 9	168	100 - 249
1, 303	9 - 14	75	250 - 499
532	15 - 19	58	Over 500
931	20 - 49		

Whenever the Nile embankments are threatened by exceptionally high floods, men and women are ordered out from the nearby villages to make the necessary repairs. Until the British occupation, this work, as well as the clearing and repair of the canals, was done by forced labor. Then hundreds of the fellahin, both men and women, were required to serve without pay as long as they were needed. The British abolished this corvée, and although the call for help is still official and mandatory, workers are paid at an established hourly rate.

Transportation and Communication Workers

Land Transport.

Transportation is a many faceted enterprise in Egypt, as will be seen from Table 18. Much of the road system consists of little more than wide pack trails, and not only the village streets but most of those in the towns and cities are narrow, unpaved alleys. Hence goods, in general, even in the cities, are still transported by pack animals (horses, mules, donkeys, and camels), hand cart, barrow, and hand porterage. Of 139,039 persons employed in land transportation in 1947, 52,282 or 36 per cent, were drivers of pack animals, pushers of carts or barrows, and porters, and these were a third more numerous than in 1937. Only the drivers of horse cabs and stable workers have yielded somewhat to taxicab and motorbus competition.

Much transportation in Egypt is a matter of individual enterprise. Of 188,690 persons reported in 1947 as occupied in some type of transportation, only 5206 were owners or managers of transport organizations, while 46,505 were working on their own account. (A large proportion of the latter were probably owners of one or more pack animals.) Only 1753 transport workers were listed as unemployed when the census was taken, but at best, employment for many of them means work today and none tomorrow, except for railroad employees and drivers of motor vehicles operating on regular schedules.

The reported quintupling between 1937 and 1947 of the number of operators of motorbuses, motor trucks, and taxicabs (see Chapter 10, Transport and Communications) reflects the improvement of city streets, the development of residential suburbs around the major cities, and above all, the increase in the mileage of surfaced roads from 252 in 1935 to 2437 in 1952. Continued road building will offer new opportunities for employment in this field, but to the detriment of the owners and drivers of pack animals - a serious matter in a country where employment for unskilled labor is at a premium.

The reported increase of about 80 per cent in the number of persons engaged in railroad operation between 1937 and 1947 is difficult to account for, since the mileage of railroads in use was increased by only about 20 per cent during that period and the amount of freight carried declined seriously, owing to deterioration in railroad upkeep and service. Some of these additional workers, however, were employed in extensive repair work that had to be undertaken after the vicissitudes of World War II.

Table 18 - Persons Engaged in Transportation

	1947			1937		
	Total	Men	Women	Total	Men	Women
Railway	38,822	38,687	135	21,394	21,387	7
Tramway	7,223	7,190	33	4,240	4,240	-
Motorbus	11,076	11,009	67	4,771	4,750	21
Motor truck	4,361	4,334	27	1,017	1,013	4
Taxicab	18,429	18,348	81	9,490	9,452	38
Horse cab	3,615	3,602	13	4,462	4,445	17
Cart and barrow	27,166	27,002	164	20,879	20,786	93
Pack animal	5,402	5,338	64	3,939	3,899	40
Porterage	19,714	19,445	269	14,675	14,552	123
Garage	1,929	1,911	18	1,213	1,207	6
Stable	1,302	1,289	13	1,447	1,425	22
River navigation	28,740	28,539	201	27,623	27,512	111
Sea navigation	9,098	9,024	74	8,068	8,031	37
Ferry boat	762	747	15	No data	No data	No data
Boat ownership and management	3,620	3,584	36	1,960	1,938	22
Warehousing, loading, etc.	294	291	3	No data	No data	No data
Care of harbors, etc.	3,970	3,922	48	No data	No data	No data
Air navigation	3,023	2,917	106	796	782	14
Pipeline	144	141	3	No data	No data	No data
Total	188,690	187,320	1,370			

Water Transport.

Although the Nile valley is well covered by railroad tracks, and the delta adequately so except in the northern border, rail freight rates are high compared to water transport rates. Consequently, much farm produce and bulky consumer goods are carried by boat on the river and the navigable canals. In fact, the amount of freight carried annually by river boat usually exceeds that carried by rail by nearly 30 per cent. Yet in 1947 only 28, 740 persons were enumerated as engaged in operating a fleet estimated at about 15, 000 sailing craft, 400 steam barges, and a large number of motor boats and tow barges. Most of the river craft are small, and also crews often shift from one boat to another.

Most of the 9098 persons engaged in sea navigation in 1947 were employed in coastwise transportation, many of them in sailing vessels. Egypt's merchant fleet was never large. At the outbreak of World War II it totaled only a little more than 100, 000 tons, more than half of which was sunk during the war. New purchases have since restored the tonnage to about its prewar level.

Air Transport.

The great increase between 1937 and 1947 in the number of persons engaged in aviation and airfield service is chiefly the result of the development of the Cairo International Airport as the principal center for air navigation between Europe and the East. Of 871 persons reported in 1947 as employed in airfield maintenance, 623 were at the Cairo and nearby Almaza airports, and of 2151 reported as directly engaged in flying and aircraft servicing, 1954 operated in and out of these two fields. Of the remainder, the majority were in airfield service at the country's other major ports - Alexandria (125), Port Sa'id (42) and Luxor (46). The six other fields are landing fields employing small maintenance staffs only.

Postal, Telegraph, and Telephone Service

Little attention was paid during the period 1937-1947 to improving Egypt's communication services, as will be seen from Table 19. (Only the telephone service experienced any substantial increase.) This may be attributed to the limited demand for such services by a largely illiterate population. Although 5259 of the country's 6575 post offices in 1951 were authorized to handle not only letter mail but parcel post packages up to 3 kilograms in weight, most of them were in shops and

Table 19 - Persons Engaged in Communications Services

	1947			1937		
	Total	Men	Women	Total	Men	Women
Postal service	5,644	5,637	7	4,911	4,909	2
Telegraph	2,457	2,452	5	2,297	2,294	3
Telephone	6,091	5,644	147	3,929	3,497	432
Wireless	454	425	29	411	397	14
	14,646	14,158	488	11,548	11,097	451

even in residences and without regular official attendants. The country's postal activity is chiefly confined to the urban centers. Of the 5644 persons in the postal service in 1947, 1805 were employed in Cairo and 685 in Alexandria.

Commerce, Trade and Banking

Of 553,271 persons occupied in commerce, trade, and banking in 1957, 407,734 (360,654 men and 47,180 women) were classified as merchants. About half of both sexes were street vendors, and among the ramainder, agents, traveling salesmen, and the like were numerous. About 4000 were cotton and grain brokers and auctioneers. That few Egyptians deal with banks is indicated by the enumeration of only about 500 bankers, bank employees, and money lenders. There are probably fewer money lenders than elsewhere in the Middle East, since debt does not afflict the Egyptian peasant population to the same extent that it does elsewhere in Asia.

Government Services

The total number of persons in government service is large. The 313,485 persons who gave it as their occupation in the 1947 census (see Table 15) consisted only of those in more or less permanent civil positions and did not include about 10,000 incumbents of elective or appointive political offices. About 130,000 were clerks and secretaries in government offices, storekeepers, tax collectors, and paymasters; the remainder were for the most part police, firemen, and prison guards (96,780), frontier and coast guardsmen (4435), and commissioned and noncommissioned officers of the army (36,744).

The Professions

Religion.

Of those engaged in religious works, the great majority are sheikhs of mosques (6492 in 1947) or other sheikhs and Koran readers (39,613), but the number of bishops, priests, and ministers and other leaders of Christian sects(5084) was large for a country which is 92 per cent Muslim.

Education.

That only 55,513 persons, or less than 3 per thousand of the population, were employed in all its educational institutions suggests, probably better than any other statistic, how far the government will have to go before it can achieve its avowed purpose of making elementary and intermediate education everywhere available and compulsory.

Medical Service.

The 1947 census enumerated 5491 doctors of medicine, 3905 midwives, and 1648 pharmacists, but it would appear from Table 20 (compiled from the Pocket Yearbook, 1953, published by the Statistical Department of the Ministry of Finance of Egypt) that a large number of them were probably operating without licenses. Even so, as recently as 1952 (the last date for which the figures are available) there was only one doctor for

Table 20 - Licensed Medical Personnel in Egypt

Profession	1948	1949	1950	1951	1952
Doctors	4,470	4,612	4,797	5,151	5,668
Dentists	553	584	591	589	321
Pharmacists	1,642	1,712	1,808	1,872	1,943
Midwives	965	996	1,046	1,191	1,246
Veterinarians	546	596	637	660	683

every 3780 of the population (as compared with one to 750 in the United States). With few exceptions these doctors were in the cities and towns.

Mobile health units operated by the government provide some medical service for the rural areas, and in a few Rural Social Centers doctors, or nurses, or both are available part time. Government operated health centers in many of the larger villages and some 250 village hospitals dispense free medical treatment. There are too few such centers, however, to be within reach of the great majority of the rural population, and most of them have only limited facilities and professional staffs that are too small adequately to serve the districts dependent on them.

Government-operated hospitals, including these village hospitals, totaled 417, with 32,038 beds and 1714 doctors in 1952. But the best staffed of them are in the larger urban centers. The Qasr el 'Aini Hospital, affiliated with the Faculty of Medicine of Cairo University, is one of the largest in the Middle East. Patients at these urban hospitals come mainly from the upper classes of the larger towns, rarely from the rural areas. Yet the failure of the Egyptian fellah to get professional medical treatment is not altogether due to the lack of doctors and the shortage of medical institutions. In large measure it is due also to his fatalistic attitude toward illness and to the vicissitudes of his daily life.

Domestic and Other Personal Services

The number of persons employed as household servants (shown in Table 21 [29]but not included in Table 15) and engaged in other personal service activities is phenomenally large. Those shown in Table 15 as engaged in personal services were mainly launderers, ironers, hairdressers, sweepers, scavengers, and others who provide urban dwellers with services not rendered by their own household staffs.

Table 21 - Domestic Servants Exclusive of Those in Farm Families, 1947

Occupation	Male	Female	Total
Housekeeping and child care	26,199	2,465,639	2,491,838
Table waiting	50,721	113,259	163,980
Cooking	21,982	2,357	35,120
Guarding	14,019	259	14,278
Chauffering	2,940	76	3,016
Carriage driving and grooming	865	25	890
Wet nursing	-	808	808
Total	116,726	2,582,423	2,699,149

NOTES

1. Louis Massignon, ed.: Annuaire du Monde Musulman, Presses Universitaires de France, Paris, 1954, p. 271.

2. James Henry Breasted: A History of Egypt from the Earliest Times to the Persian Conquest, New York, 1912, pp. 25-26.

3. M. M. Mosharrafa: Cultural Survey of Egypt, London, 1947, Part 1, p. 17.

4. The following is the formula for converting years of the Islamic calendar, counted from the Higra (A.H.) into those of the Gregorian calendar (fractions being omitted):

$$\text{A.H.} - \frac{3 \times \text{A.H.}}{100} \text{ plus } 621.6 = \text{the year A.D.}$$

5. Madame Ahmed Hussein: Women in the Moslem World (A pamphlet published by the Egyptian Embassy in Washington), 1954.

6. 1,346,075 Copts were enumerated in the 1947 census.

7. Sidney Low: Egypt in Transition, New York, 1914, p. 267.

8. Charles Issawi: Egypt at Mid-Century: An Economic Survey, London and New York, 1954, p. 65.

9. Ahmed Hussein: Rural Social Welfare in Egypt, Cairo, 1951.

10. That a person reported to the census taker that he was able to read and write was no indication of the extent of his ability. For lack of practice, many adults who had had some training in reading and writing in an elementary school may well have lost that ability, while still reporting it to the census taker.

11. Annuaire Statistique, 1949-50 et 1951-52, Dépt. de la Statistique et du Recensement, Min. des Finances et de l'Économie, Cairo, 1953.

12. Statistical Pocket Year-Book, 1953, Statistical Dept., Ministry of Finance and Economy, Cairo, 1954.

13. Issawi: op. cit., p. 28.

14. Ibid., p. 68.

15. The Development of Education under the New Regime (A government pamphlet issued in 1954).

16. The first census that can be considered as at all systematically conducted was taken in 1897, when the population was enumerated as 9,714,525. Since then censuses have been taken during the seventh year of every decade. Attempts at counting the population were made in 1800, 1821, 1846, and 1882, but the result of none of these was more than a rough approximation.

17. See Issawi: op. cit., pp. 54-55. For problems of census taking in Egypt see also: Wendell Cleland: The Population Problem in Egypt, Lancaster, Pa., 1947.

18. Population Census of Egypt, 1947, Statistical and Census Dept., Ministry of Finance and Economy, Cairo, 1954.

19. Doubt as to the accuracy of the 1947 census is based mainly on two premises: (1) that the reported increase in the population of certain urban centers over the count in the 1937 census is so abnormal as to be unexplainable, and (2) that the reported increase in the population as a whole over that enumerated in the 1937 census seems too great. That the populations of Cairo and Alexandria could have increased nearly 60 and 30 per cent, respectively, is considered particularly questionable, and that the total population could have increased 13 per cent over the 15,932,694 of 1937 is scarcely to be reconciled with the reported decline in the birth rate and increase in the death rate from the mid-1930's to the early 1940's, as shown in Table 5.

As against the first criticism, consideration must be given to the fact that between 1937 and 1947 the number of dwelling houses in Cairo increased by 44 per cent and in Alexandria by nearly 30 per cent according to counts made in preparation for the two censuses, counts in which there would seem to be little chance of any great error. There was also a substantial migration of the rural population to the urban centers of the delta during World War II. Augmented industrial production, stimulated by the shortage of imported goods, greatly improved the opportunities for employment in the urban centers during this period, and even greater demand for personnel for services of maintenance, supply, and repair was created when large Allied forces occupied the northern part of the country during the latter stages of the North African campaign.

As to the second criticism, Table 5 also shows that, during the latter years of the war and years immediately following, the birth rate was again very much on the rise and the death rate substantially declining. Presumably both of these conditions, in part at least, resulted from the unusual prosperity brought to the country by industrial expansion and the presence of the Allied forces. Furthermore, in any consideration of the contention that the 1947 census gives too great an increase over the population of 1937, account must be taken of the fact that the 1937 figure for the total population was widely criticized as being too low. (Issawi, op. cit., pp. 54-55.) If the official statement on methods of procedure can be accepted at face value, the 1947 census was rather carefully taken. In preparation for it two years were spent in defining the limits of hamlets and villages and the divisions, streets, and squares of towns and cities. Then, before the actual census taking, between sunset of March 26 and sunrise of March 27, 17,000 government agents had made a count of houses, industrial establishments, etc. The simple enumeration of population and of the number of employees in industrial establishments are probably less questionable than the reports on occupation, employment status, age, literacy, and other matters that the census taker is ordinarily unable to verify. In view of the high percentage of illiteracy in Egypt much inaccuracy is to be expected in such matters. The peasant and working-class population, fearful and resentful of authority from long experience of mistreatment by both minor officials and employers, are apt to give whatever answers to questions respecting occupation and employment status they think will put them in the best light.

20. Of the total population of 19,021,840 reported in the 1947 census, 18,452,650 were counted as domiciled in the valley and delta, 353,176 in the Canal Zone, 160,941 in the five administrative districts into which the remainder of the country is divided - the Frontier Districts of Bahariya oases (6678), Red Sea (15,929), Sinai (37,670), Southern Desert (32,503), Western Desert (68,161). The remainder, an estimated 55,073, were nomads, as mentioned above.

21. From Demographic Yearbook, Statistical Office, Department of Economic Affairs, United Nations, 1952.

22. Obtained by correspondence from the Statistical and Census Department, Ministry of Finance and Economy, Cairo.

23. From Demographic Yearbook, Statistical Office, Dept. of Economic Affairs, United Nations, 1952.

24. Cleland, op. cit., pp. 38-39.

25. Compiled from Annuaire Statistique, 1949-1950 et 1950-1951, op. cit., 4.

26. Census of Industrial Production, Statistical Department, Ministry of Finance and Economy, Cairo, 1953.

27. William J. Handley: The Labour Movement in Egypt, The Middle East Journal, July, 1949, p. 290.

28. See Issawi, op. cit., p. 87.

29. From Population Census of Egypt, 1947, Statistical and Census Department, Ministry of Finance and Economy, Cairo, 1954, Table 21.

4. AGRICULTURE

Egypt has long been thought of as a country with only one natural resource of any importance - the rich, deep alluvial soil of the valley and delta of the Nile River. Recent discoveries of sizable deposits of certain industrial minerals, particularly iron ore, petroleum, and manganese, and plans for the development of hydroelectrical power give promise of considerable industrial growth, but there is little doubt that the country will always be preëminently agricultural. For, extensive as are the present plans for industrial development and however bright their prospects appear to be, it is on the success of the new government in providing more irrigation water to bring more land under cultivation that its viability chiefly depends. Indeed industrial development itself seems most promising in the processing of agricultural raw materials, which are now generally exported.

Two-thirds of the national capital of Egypt is presently invested in farm land, livestock, and farm equipment, and 60 to 70 per cent of the working population, representing at least 70 per cent of the total population, is directly engaged in working the land. Agriculture produces nearly 40 per cent of the national income and supplies 94 per cent of all exports. It supplies the raw material for 75 per cent of the local factories and mills, in which 70 per cent of the industrial labor is employed and 25 per cent of the industrial capital invested. Of the country's commercial firms, wholesale establishments, and retail stores, 56 per cent, employing 40 per cent of all personnel in trade, are engaged in handling local agricultural produce.

Nowhere else in the world are so many people in such a small area dependent on agriculture. The 1947 census of Egypt enumerated 18,805,826 people living in the 13,443 square miles in the Nile valley and delta and the Suez Canal Zone, or about 1400 per square mile. The great majority of them get their living directly or indirectly from the soil. The rest of the population was estimated at only 122,000. Other cultivable land (mainly in the oases of the Western Desert and along the Mediterranean coast west of Alexandria) brings the total area on which agriculture is possible at present to no more than 3.5 per cent of the country's area of about 386,000 square miles. [1]

That Egypt is able to sustain so large a population on so small an area is due primarily to four factors: the basic fertility of the soil of the Nile valley and delta and its responsiveness to intensive cultivation and the heavy application of commercial fertilizers; an annual temperature range with no extremes at either end of the scale and skies practically never overcast; an unfailing water supply distributed with almost mathematical precision by one of the world's most elaborate and efficiently operated irrigation systems; and an agricultural population skilled in extracting the utmost return from the soil by the application of what amounts to gardening methods in the cultivation of most crops.

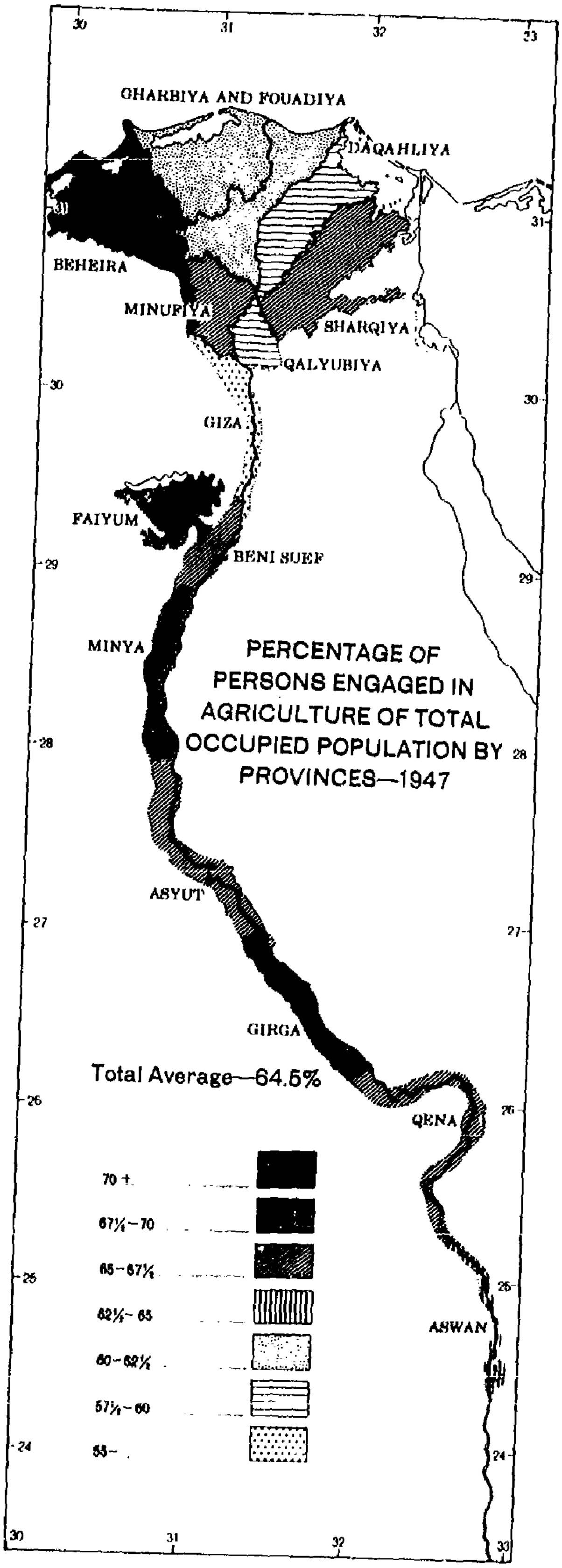
Another important factor is the low standard of living of the Egyptian peasant. Under Egypt's rainless skies and continuous warm temperatures, his dwelling and his clothes require little in the way of cash outlay, while his monotonous diet is produced almost exclusively on the bit of ground he works, whether as owner or tenant, or is traded for in his village market.

The Nile valley and delta, taken as a whole, is probably the most intensively cultivated and most productive continuous area of its size in the world. It is frequently described as resembling a long strip of market garden. The climate admits of an exceptionally broad range of crops. Temperatures throughout the year are high enough so that there is no time that the land must lie idle, if water is available for irrigating it; the autumns and winters, with rarely even a touch of frost anywhere, are warm enough for the growing of most temperate zone crops, and the summers suit practically all subtropical and tropical crops.

It would be difficult to mention a crop - grain, vegetable, fruit, or fiber - that is not grown to some extent in Egypt. Its ancient position at the crossroads of trade between East and West and the numerous invasions and large-scale migrations into the country from many directions have resulted in the introduction of practically the whole gamut of tropical, subtropical, and temperate zone crops. Most of them have done well there; the chief exceptions are certain temperate zone fruits that require an annual dormant period of some length. For many crops the average yield per unit area is among the highest in the world, and for a number it outranks that of all other major production areas.

Since sunshine is practically constant and the supply of water from the Nile is dependable, farming in Egypt need never be a gamble. The farmer runs no risk of cold spring rains rotting his seed, of summer droughts stunting his crop, or rains at harvest spoiling his grain. Except in the northern delta precipitation never has to be considered, and even there it is of too little account to be mentioned as a source of supply by the Irrigation Department.

From computation based on careful measurements of the Nile flood, the farmer knows at the beginning of each crop season how much of a particular crop he can plant with assurance that there will be water enough available for it. How much water he needs for each crop he plants and when and in what quantities it should be let into his field ditches and when it should be withheld, he knows from long experience. (This does not mean, however, that no farmer ever uses more water than he needs. He is more apt to do so than otherwise; a problem with which the Irrigation Department often has to contend.)



GHARBIYA AND FOUADIYA
DAQAHLIYA
BEHEIRA
MINUFIYA
SHARQIYA
QALYUBIYA
GIZA
FAIYUM
BENI SUEF
MINYA
PERCENTAGE OF PERSONS ENGAGED IN AGRICULTURE OF TOTAL OCCUPIED POPULATION BY PROVINCES—1947
ASYUT
GIRGA
Total Average—64.5%
QENA
ASWAN
70 +
67½–70
65–67½
62½–65
60–62½
57½–60
55–

Table 1 - Principal Egyptian Crops

(Production in thousands)

Crop	Unit of production	1930-1931 Area in feddans	1930-1931 Production	1930-1931 Yield per feddan	1940-1941 Area in feddans	1940-1941 Production	1940-1941 Yield per feddan	1950-1951 Area in feddans	1950-1951 Production	1950-1951 Yield per feddan
Clover		1,518			1,832			2,121		
Cotton	qentar	1,682	6,357	3.78	1,643	8,374	5.09	1,979	8,075	4.08
Corn	ardeb	2,113	14,188	6.71	1,527	9,157	6.00	1,655	10,151	6.13
Wheat	ardeb	1,588	8,359	5.26	1,502	7,491	4.99	1,496	8,060	5.39
Rice	dariba	64	76	1.18	448	605	1.35	488	656	1.35
Sorghum	ardeb	329	2,949	8.95	429	3,352	7.81	423	3,693	8.73
Beans	ardeb	423	1,765	4.17	368	1,835	4.98	319	1,494	4.68
Barley	ardeb	294	1,758	5.97	254	1,754	6.86	118	829	7.02
Sugar cane	qentar	65	47,352	725.00	77	52,649	678.00	86	62,533	727.00
Lentils	ardeb	82	308	3.76	82	389	4.72	75	292	3.39
Fenugreek	ardeb	105	342	3.25	79	324	4.90	53	203	3.83
Onions	qentar	43	6,468	149.00	32	5,490	169.00	36	5,226	142.00
Peanuts	ardeb	21	194	9.11	25	247	9.74	21	249	10.07

1 feddan = 1.038 acres.
1 ardeb = 5.444 bushels.
1 qentar = 44.928 kilograms = 99.05 lbs.
1 dariba = 945 kilograms = 2083.34 lbs.
Clover usually averages 6-8 tons per feddan.

SOILS OF THE NILE VALLEY AND DELTA

The soil to which the valley and delta of the Nile owe their legendary reputation of being the world's most fertile and productive agricultural land is the silt that has been carried down through the ages by the flood waters of the river. It is purely alluvial except along the borders of the valley, where there is some mixture with desert sand, and at the northern edge of the delta, where shell sand is combined with it.

Sources

The depth of this silt deposit averages about eleven meters in the northern part of the delta and decreases only to a little more than seven meters even as far south as the neighborhood of the Aswan Dam. It has been contributed mainly by the Blue Nile and the Atbara River, both of which bring down each year great quantities of material disintegrated from the granites, gneisses, shales, and sandstones of the Ethiopian highlands and the volcanic rocks which thickly crown their summits. The contributions of the slow-moving White Nile are chiefly chemicals in solution and a fine, flocculent clay. Its principal sources are the Sobat River, which has its sources in Ethiopia, and the Bahr el Ibel, which brings water from Lakes Victoria and Albert on the west-central African plateau. The latter loses most of whatever silt it picked up in the great swamp known as the Sudd. Although the Sobat carries a heavy load of silt when in flood, all but the lightest of its components, too, are lost in the swamps and grassy plains through which it flows in its lower reaches and in the impounding of its mouth during the White Nile's high water season.

Annual Silt Deposit

Shakespeare in his "Anthony and Cleopatra" wrote that

> ". . . The higher Nilus swells
> The more it promises: as it ebbs, the seedsman
> Upon the slime and ooze scatters his grain,
> And shortly comes to harvest."

Actually, except on the small percentage of the land still under basin irrigation, the contribution made by the Nile silt today is practically negligible, and even on basin irrigated land only a small proportion of the suspended matter carried by the Nile flood is deposited.

The amount of silt carried by the Nile as suspended matter as it entered Egypt during three successive flood seasons and the amount still in suspension when the river reached Cairo are given in Table 2.[2]

Table 2 - Suspended Matter Carried Past Wadi Halfa

(in million tons)

	1929	1930	1931	Average
Wadi Halfa	136.13	75.69	118.27	110.0
Cairo	73.81	41.62	57.39	57.6
Difference	62.32	34.07	60.88	52.4

It might be assumed that the suspended matter lost between Wadi Halfa and Cairo was spread over the land or was, at least, available for that purpose. But careful estimates of the amount of silt taken from the river by canals and pumps during these three seasons indicate that it averaged only about 16.60 million tons, or 31 per cent of the suspended matter lost. The conclusion reached is that the greater part by far of the lost material - nearly 70 per cent of that in suspension when the river passed Wadi Halfa - had fallen out of suspension by the time Cairo was reached and was carried along as bottom load, contributing nothing to the fertility of either valley or delta.

Furthermore, as shown in Table 3,[3] the proportion of silt carried by the Nile is exceeded by many of the world's rivers. Also, now that so large a proportion of the cultivated land of the valley, and all of that of the delta, has been converted to perennial irrigation and is no longer watered by flooding, the amount of silt added annually to the land is very small. It is estimated that even on land still under flood irrigation the average annual deposit is barely enough to cover it to a depth of a little more than one millimeter.

Dr. John Ball, for many years connected with the Survey Department of the Egyptian government and an authority on the physiography of the Nile valley and delta, estimated, on the basis of measurements made by the Irrigation Service, that during the flood seasons of 1929, 1930, and 1931, out of an average of 10.95 million tons of suspended matter taken from the Nile during those years by the canals that supply flood water for the sections of Upper Egypt under basin irrigation, an average of 8.77 million settled on the land. This would have been sufficient to cover all the land then under basin irrigation to a depth of 1.03 millimeters. But of an average of 5.95 million tons taken by canal and pumps supplying the perennially irrigated sections in Upper Egypt (that is, in the valley of the Nile and the Faiyum Oasis), only an average of 2.66 million tons was carried onto the land by the irrigation ditches and only an infinitesimal part added from the average of 2.74 million cleared from canals and drains

Table 3 - Average Annual Proportion by Weight of Silt Carried by Selected Rivers

River	Proportion	River	Proportion
Colorado	1 : 142	Mississippi	1 : 1500
Missouri	1 : 265	Rhone	1 : 1775
Rio Grande	1 : 291	Nile	1 : 1900
Po	1 : 900	Danube	1 : 2880

each year. On the delta (all under perennial irrigation), out of an average of 10.44 million tons taken by canals and pumps, only an average of 1.49 million tons accrued to the land. Of this about two-thirds was spread from canal and drain clearings.[4]

The average amount of silt available during those three years would have been only enough to cover the perennially irrigated land of Upper Egypt to a depth of 0.66 of a millimeter each year, and the amount actually used on the land would have covered it to a depth of only 0.31 of a millimeter. On the delta, if all the available silt had been spread evenly over the cultivated land, it would have covered it annually to an average depth of 0.43 of a millimeter, but the amount so used on agricultural land would have been sufficient only for an average coverage of 0.06 of a millimeter.

The question naturally arises as to what is done with the greater part of the mud cleared annually from the canals and drains - an estimated average for the three years under study of 3.29 million tons from those of the perennially irrigated sections of the valley and 9.95 million from those of the delta. With its high content of fine clay, Nile mud is sticky and plastic when wet and dries very hard and tough. Much of what is cleared from canals and drains is consequently used in repairing their banks, which are commonly piled wide enough to serve as roads. It is also the material out of which the unburnt, sun-dried bricks much used for house construction in the valley are molded.

Composition and Structure

The productiveness of the perennially irrigated land of the Nile valley and delta is thus not to be credited to the refertilizing effects of the annual flood, but rather to the mineral and chemical content of the silt laid down before the present irrigation system was developed, and to the mechanical

structure and great depth of the deposit and its responsiveness to heavy chemical fertilization.

The great variety of valuable soil-making and plant-feeding elements in the Nile silt and the uniformity of their distribution in Nile water throughout the whole course of the rivers are indicated in Table 4,[5] compiled from analyses made in the laboratories of the Survey Department of the Egyptian government of silt collected at Aswan and Cairo during the flood season of 1906.

The mechanical structure of the soil varies greatly, however, throughout the valley and delta. As would be expected, the fineness of the soil and its clay content in general increases from south to north and outward from the Main Nile and its past and present delta branches. But there are numerous variations of this general rule, due to the unevenness of the underlying bed on which the Nile silt has been laid down and to lateral shifts in the course of the river itself through past ages. Nowhere, however, is the clay content less than 20 per cent, and it may be as high as 50 to 70 per cent. This universal clay content explains the continued productivity of the Nile soils and their response to intensive cultivation.

Black Alkali

On the other hand, the soils with high clay content are apt to give the cultivator his most serious problem. The clay is so fine that the soils with heaviest proportions of it are quite unworkable unless they also contain small proportions of soluble calcium and sodium chlorides, which have the faculty of floccuating the clay and thus rendering it permeable to air and water.[6] Also in heavy clay the rise of the subsoil water level, a concomitant of perennial irrigation caused by excessive use of water and leakage from the canals unless good drainage is maintained, tends to produce the so-called "black alkali" soils - soils of varying degrees of infertility depending on the proportion in them of defloccuating chemicals.[7]

The term "black alkali" is applied to soils in which the proportion of soluble sodium carbonates and bicarbonates and insoluble calcium carbonate and magnesium silicate is higher and the organic content lower than in fertile soils. In them, too, the magnesium and calcium of the original silt have been largely replaced by sodium carbonate. Sodium carbonate has the faculty of so defloccuating clay (making it so fine) that it is impenetrable to air and water. Its solvent action on organic matter is also such as to produce a black skin on the soil surface, from which the term "black alkali" is derived.

The chemical action producing these impenetrable and consequently infertile soils is not known with certainty. But there appears to be strong evidence that the replacement of the original calcium and magnesium by sodium is due to certain bacteria which grow around plant roots in waterlogged soil. These bacteria are believed to promote the oxidization of the organic matter and reduce the sulphates in the soil to sulphides. The result is greatly increased alkalinity.

Table 4 - Percentage Chemical Composition of Nile Silt

Chemicals	Aswan	Cairo
Silica	49.47	48.88
Iron oxide	12.17	11.45
Aluminum, titanium, etc.	20.30	20.58
Manganese oxide	*	*
Lime	2.77	3.68
Magnesium	3.04	3.36
Potash	2.33	2.27
Soda	1.82	2.02
Phosphoric acid	*	0.25
Sulphuric acid	*	0.07
Carbon dioxide	None	0.35
Combined water	8.10	7.09

* Samples too small for determination

Fortunately, although these "black alkali" soils develop throughout the valley and delta, they rarely occur, except in patches of not more than two or three feddans. The process of restoring them to fertility consists of applying a layer of gypsum (about one ton to a feddan), which speedily flocculates the clay, and then washing out the sodium carbonate by flooding and thoroughly draining off the flood water.

The Problem of Salt-Impregnated Soils

Beneficial as is the presence of sodium chloride in small amounts in preventing the formation of sodium carbonate, its excessive accumulation is also a menace. Excessive accumulation is particularly apt to occur in the northern part of the delta where the subsoil is heavily impregnated with salt and the maintenance of sufficient drainage to carry off the salt that may rise by capillary action is difficult. The presence of salt is accountable

for extensive areas in the northern part of the delta that still await reclamation.

The reclamation process involves leveling the land and then flooding it to wash away the greater part of the salt down to root depth. Rice or dineba (small millet), both salt resistant, are then grown for one or more seasons and followed by a crop of berseem (Egyptian clover). After that, cotton and other crops can be grown, but rice crops, with their heavy water requirement, have to be intervened at more or less regular intervals in order to keep the soil sweet, since the salt continues to rise.

That reclamation of this saline land has not proceeded more rapidly, in view of Egypt's great need for more cultivable land, is due to the fact that sufficient water for washing is to be had only during the flood season of the Nile, as well as to the difficulty and expense of installing the necessary drainage, most of which has to be effected by pump.

Use of Fertilizers

Phosphate (derived chiefly from the apatite, calcium phosphate-chloride), potash (from feldspar and mica), and lime are generally present in the Nile silt in sufficient amounts for good growth of most crops, except sugar cane, for which substantial supplements of phosphate are required. Nitrogen is in such short supply that continuous replenishment is necessary, at least on land under perennial irrigation. A great deal of imported fertilizer is used and the amount has been steadily increasing for many years, but as will be seen from Table 5 by far the greater part of it is nitrogen in various forms. Of the fertilizer imported in 1950 over 90 per cent consisted of nitrogenous chemicals, enough to have applied about 106 kilograms (233 pounds) per feddan to all the land under cultivation that year.

Not only is the nitrogen contained in Nile silt in small amount both as organic matter and in chemical form, but the traditional methods of cultivation add little organic nitrogen to the soil. Berseem (the quick-growing Egyptian clover) is a regular item in every cultivator's crop rotation; the total area planted in 1950 (2,121,000 feddans) was 22 per cent of the acreage planted that year in winter, summer, and autumn crops, and the contribution of nitrogen that the berseem fixes from the atmosphere is important. However, berseem is too valuable and too greatly needed for fodder ever to be ploughed under as green manure. In fact, cover crops of any sort are little if ever used.

Temperature conditions throughout most of the year and moisture conditions under perennial irrigation are so favorable that organic matter decomposes very fast and its nitrogen content is speedily exhausted. The nitrogen contained in the Nile silt (mostly in the form of calcium nitrate), plus that fixed from the atmosphere by berseem and other leguminous crops, is probably sufficient for crops grown under basin irrigation, in which most of the flood water silt is left on the land, one crop only is grown each year, and the land is left fallow for several months.

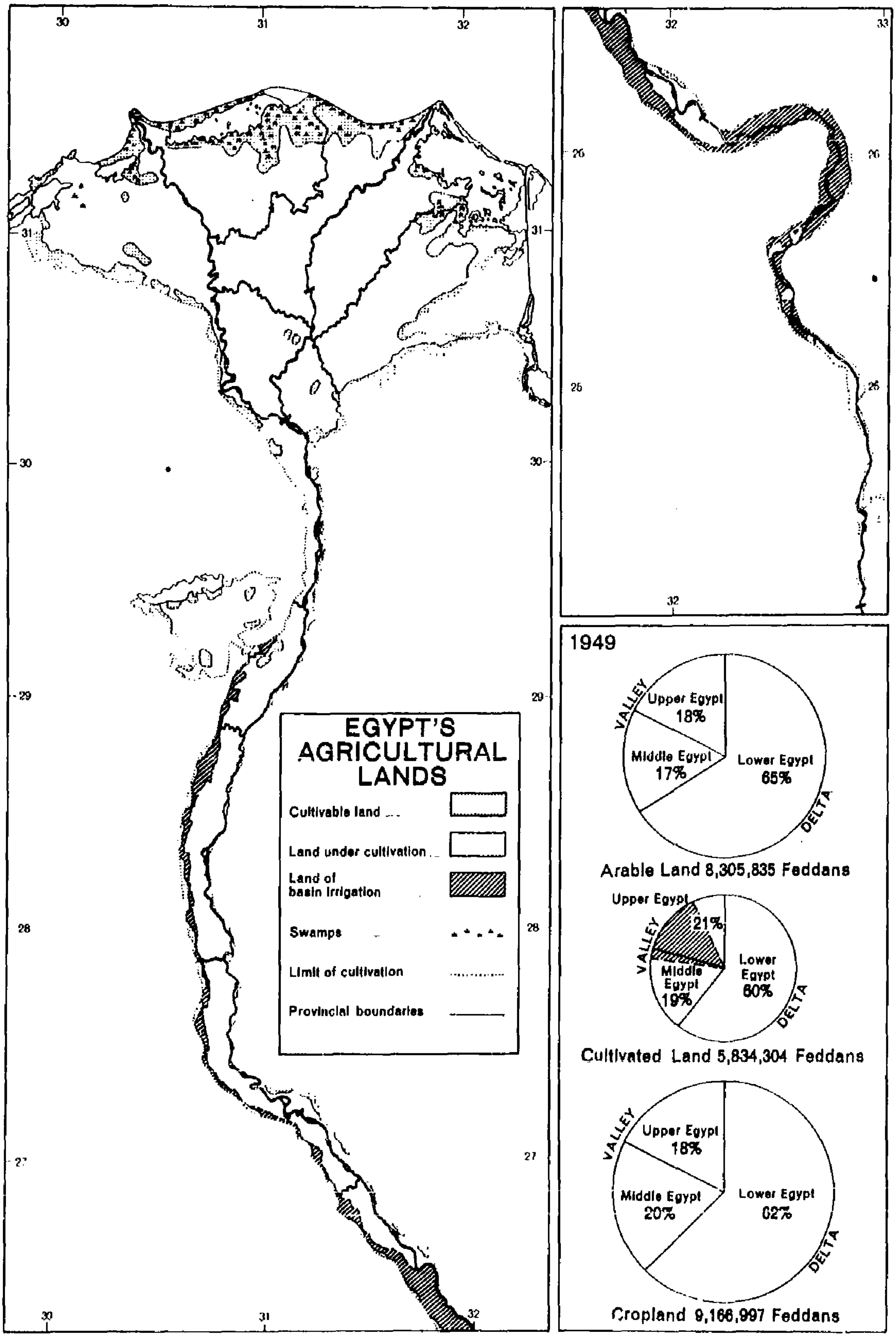
Table 5 - Imports of Chemical Fertilizers in Metric Tons

Fertilizer	1916	1926	1936	1950
Sodium nitrate	19,350	172,849	207,380	353,044
Calcium nitrate	--	25,236	176,187	199,349
Ammonium nitrate	--	--	19,581	69,233
Ammonium sulpho-nitrate	--	--	15,637	200
Nitro-chalk	--	--	46,243	--
Ammonium sulphate	2,620	3 453	18,296	17,751
Calcium superphosphate	3,250	36,791	86,661	43,380
Others	212	4,744	2,453	549
Total	25,432	243,073	572,428	683,506

Little animal manure is used. Stock raising is still little developed even on the large estates. For the small farmer the manure from his draft and milk animals is his principal cooking fuel. A good deal of cotton meal cake is used for fertilizer on the larger farms, but if the small farmer is able to buy it at all it is, with few exceptions, for cooking fuel. Composting is practically unknown. In fact, with the farmer also using for fuel whatever straw and cornstalks he does not feed to his stock, there would be little material left for compost. Mounds consisting of the remains of old villages were long a valuable source of nitrogen that was easily accessible to most parts of the valley and delta, but this source has now been practically exhausted. With the passage of time the accumulations of organic matter of which the mounds were largely composed were converted into nitrates by bacterial action. Camel trains carrying loads of earth from these mounds to the farmlands, where it was used principally for fertilizing the corn crop, were once a familiar sight in the Egyptian landscape.

CULTIVATED AND CULTIVABLE LAND

In 1950 a total of 5.8 million feddans was under cultivation. Of these 3.5 million (about 60 per cent) were in the delta: 1.4 million (nearly 25 per cent) between the two delta branches of the Nile, 23 per cent east of the Damietta Branch and 12 per cent in Beheira province west of the Rosetta Branch. Of the remainder, 19 per cent was in Middle Egypt, as the four



EGYPT'S AGRICULTURAL LANDS
Cultivable land
Land under cultivation
Land of basin irrigation
Swamps
Limit of cultivation
Provincial boundaries
1949
Upper Egypt 18%
Middle Egypt 17%
Lower Egypt 65%
VALLEY
DELTA
Arable Land 8,305,835 Feddans
Upper Egypt 21%
Middle Egypt 19%
Lower Egypt 60%
VALLEY
DELTA
Cultivated Land 5,834,304 Feddans
Upper Egypt 18%
Middle Egypt 20%
Lower Egypt 62%
VALLEY
DELTA
Cropland 9,166,997 Feddans

northernmost valley provinces (Giza, Beni Suef, Minya, and Faiyum) are sometimes called, and 21 per cent in the Upper Egypt provinces (Asyut, Girga, Qena, and Aswan).

At the turn of the century, with none of the present storage reservoirs and no structure for raising the level of the Nile during the low-water period but the barrage across the heads of the delta branches of the river, roughly 5,200,000 feddans were under cultivation, of which 3,000,000 were in the delta and 2,200,000 in the valley. Of the latter, 1,500,000 feddans were then under basin irrigation. As more and more dams and barrages have been built with increased capacities, and as new canals have been dug and old ones extended, there has been a slow but steady increase both in the land under cultivation and also in land thought to be cultivable (Table 6). By 1950 there remained only about 930,000 feddans under one-crop basin, or flood irrigation as compared with nearly 5,000,000 under perennial irrigation. It was estimated that this area would be reduced by at least a third by 1954.

Table 6 is from the Annuaire Statistique published by the Department of Statistics and Census of the Egyptian government. The National Economic Planning Board, which was set up after the establishment of the republic in 1952, has arrived at a rather different estimate of the land that can be brought under cultivation, by taking into consideration the effects of the

Table 6 - Cultivable and Cultivated Land

(in thousand feddans)

Year	Cultivable			Cultivated		
	Total	Delta	Valley	Total	Delta	Valley
1930	8239	5403	2835	5548	3229	2319
1950	8305	5393	2912	5834	3493	2340

proposed high dam above the present Aswan Dam (see Chapter 5, Irrigation). This Board estimates that nearly 1,735,500 feddans could be added on the desert and seaward sides of the delta, including 278,500 that could be reclaimed from the coastal lakes, and that 2,230,000 feddans on the desert borders of the valley, ranging up to 20 meters above the present farthest reach of irrigation water, could be brought under cultivation by pump irrigation.

In the delta the highest proportion of land under cultivation is in the central and southern provinces. The ratio decreases northward toward the marshlands bordering the sea and the coastal lakes, where drainage is difficult to manage and the soil tends to be saline. Over the years considerable progress has been made in reclaiming this barari (Arabic for flat, barren land); further reclamation will depend on how much more water can be stored for irrigation. The proportion of land under cultivation and its productivity decrease also toward the desert edges east and west, where the heavy, black, clayey soil grades out to a light, grayish, sand-and-alluvium mixture, requiring much water. In the valley proper and the Faiyum the soil is much more uniform, and its cultivability and productivity depend mainly on the availability of irrigation water.

THE AGRICULTURAL SEASONS

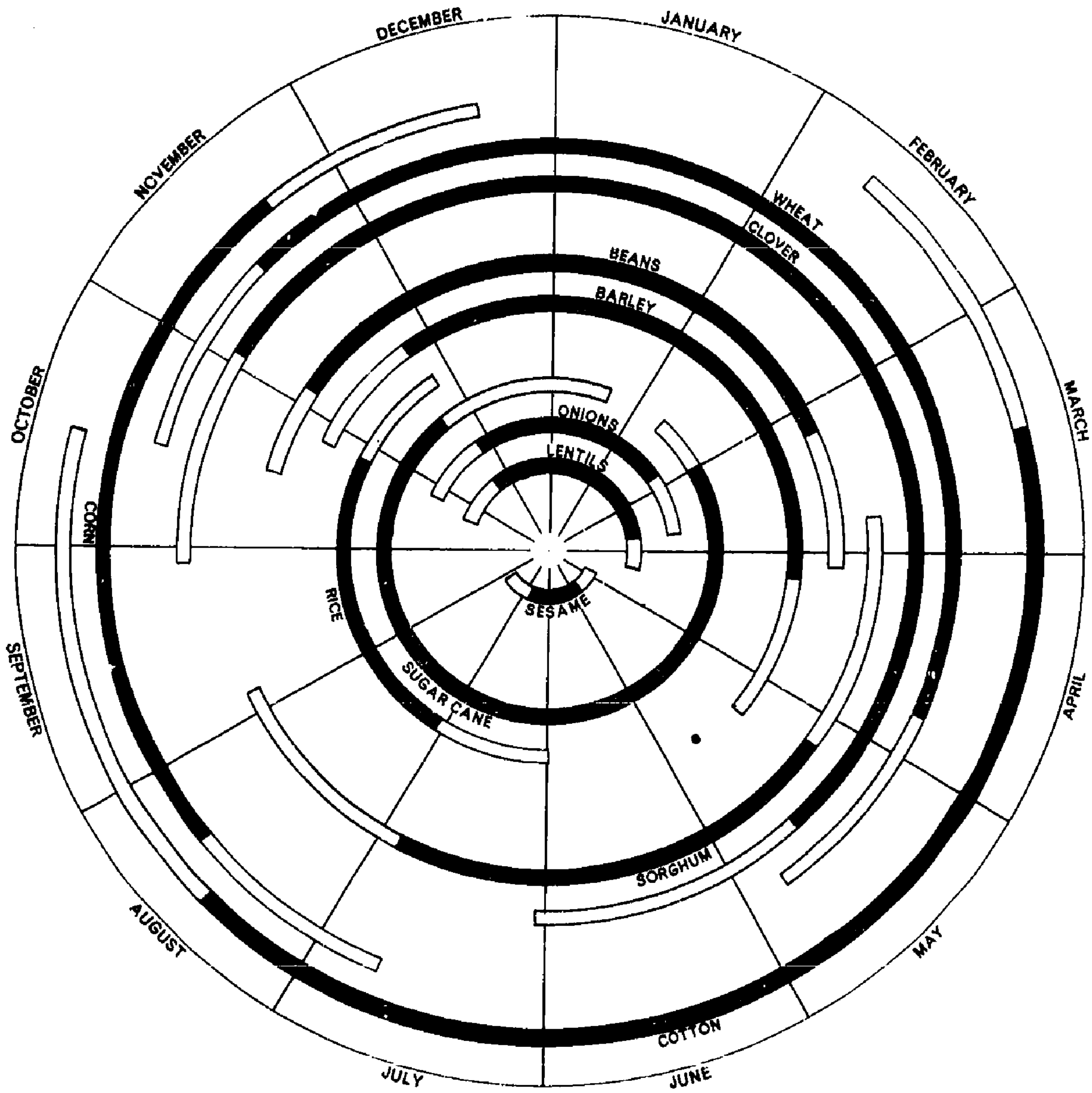
Since a population estimated at 24,000,000 depends almost exclusively on the agricultural production from some 5,800,000 feddans of land, a feddan on the average must support nearly four persons. One must, however, distinguish between the total cultivated area and the total crop area. The 930,000 feddans still under basin irrigation in 1950 yield only one crop a year, with the exception of relatively small sections irrigated for a summer crop by water pumped or raised by various primitive devices from wells or from the Nile itself. Elsewhere year-round cultivation is interrupted only by the fallow periods of the regular crop rotations and the agricultural year is divided into three seasons, as shown in Table 7. In the winter season (shitwi in Arabic), nearly 47 per cent of the total crop area is cultivated; in the summer season (saifi), 36 per cent; and in the autumn season (nili), 17 per cent. Intensity of cultivation is highest in the delta, where the total crop area in normal years is 1.63 times the cultivated area and on land immediately adjacent to the Nile branches and the main canals is nearly double.

The duration of the agricultural seasons varies somewhat between the upper valley and the northern border of the delta, and seasonal crops everywhere overlap considerably. Thus the winter crop season is from October or November to April or May, the summer season from April or May to October, and the autumn season from August to November, depending on location, type of irrigation, and time of planting and harvesting for particular crops.

Table 7 - Land Cultivated by Agricultural Seasons
(in thousand feddans)

Year	Total cultivated area	Winter crop	Summer crop	Autumn crop	Orchards	Total crop area
1930	5548	3925	2757	1918	33	8633
1940	5364	4139	2606	1647	77	8469
1950	5834	4307	3264	1566	86	9225

CROP SEASONS IN EGYPT



Sowing

Growing

Harvesting

The winter season, with around 4,500,000 feddans of crops, leads in area under cultivation. In the delta the area in winter crops is 47 per cent of its total annual crop area, in Middle Egypt 46 per cent, and in Upper Egypt 54 per cent (This is the only season when a crop can be grown on land solely under basin irrigation, and there the seed cannot be planted until November, after the flood water has soaked the soil and the surplus has been drained off.) Clover and wheat are the principal winter crops; they occupy together 80 per cent of the land under cultivation. Horse beans rank third on 10 per cent of the land. Other crops are barley, lentils, fenugreek, and onions.

About 3,000,000 feddans are cultivated in summer. Of this area, 62 per cent is in the delta, 17 in Middle Egypt, and 21 in Upper Egypt. (Where summer crops are grown on basin land by irrigating it with pumped or lifted water, the crop must be off the land by the end of August since the annual flooding cannot be delayed beyond that date.) Cotton is the leading summer crop, occupying more than half the total crop area. Rice and sorghum normally occupy 22 and 13 per cent, respectively, although the area planted to the former may be severely limited in years of abnormally low flood. Other important summer crops are sugar, melons, sesame, and peanuts.

Somewhat more than 1,500,000 feddans are normally planted in the autumn season. Of this area, 66 per cent is in the delta and 27 per cent in Middle Egypt. The flooding of the basin lands of Upper Egypt in August very much limits the growing there of autumn crops. Corn is the leading autumn crop, occupying more than 90 per cent of the area planted. The greater part of the remainder is in sorghum and vegetables. A special variety of rice is also grown, but its yield is low as compared with corn and sorghum, and the total area allotted to it is small. For irrigating the autumn and winter crops the water is supplied from the free flow of the Nile. But only the release of water stored in the Aswan and Gebel Aulia reservoirs makes it possible to grow summer crops on so large an area.

FARM TOOLS

The tools the Egyptian peasant uses to work his land are few and simple and differ little, if at all, from those used by his ancestors thousands of years ago. Those to which he hitches his draft animals - cow, buffalo, and sometimes camel - singly or in team, are the plow (mihrath), leveling scoop (kassabia), furrower (batana), drag (nattata), and threshing sledge (norag). His hand tools are the hoe (fass) and sickle (mingal).

The mihrath is a thick stake with a metal point, which serves as both share and handle, and a draft-bar attached at an angle above the horizontal so that when it is drawn forward the point is pulled into the soil. The mihrath opens only a shallow furrow and does not turn it. But there is no need to turn the furrows where the roots of the previous crop rot so quickly in the continuous warmth of the Egyptian climate, and to do so would only add to the labor of keeping the fields as level as possible for the free

flow of irrigation water. If the soil is not sufficiently worked up with one plowing, the farmer may plow it several times in different directions. But deep plowing would also involve the risk of bringing to the surface the salt accumulations against which the Egyptian farmer almost everywhere must be constantly on guard. Thus, even the tractors that are coming to be used more and more for plowing on the larger holdings have attachments for shallow plowing.

The kassabia, a two-handled, wooden device resembling a large dustpan, and the nattata, a drag of heavy timber on which the farmer usually rides to give it greater weight, are used for leveling and smoothing the fields. The batana, a device consisting of two boards so fastened together that they converge at one end but are open at both ends, is used for pushing the earth into furrows, as in making the low banks for separating the plots of land for irrigation purposes.

The norag is a heavy sledge mounted on sharp iron discs, usually twelve in number and arranged in three groups of four set off-track from each other. Drawn around and around on a pile of wheat or barley, it both separates the grain and chops the straw. Since straw is a major item in summer stock feed, the chopping of it is considered so important that, even where mechanical threshers are used, an attachment for that purpose is added.

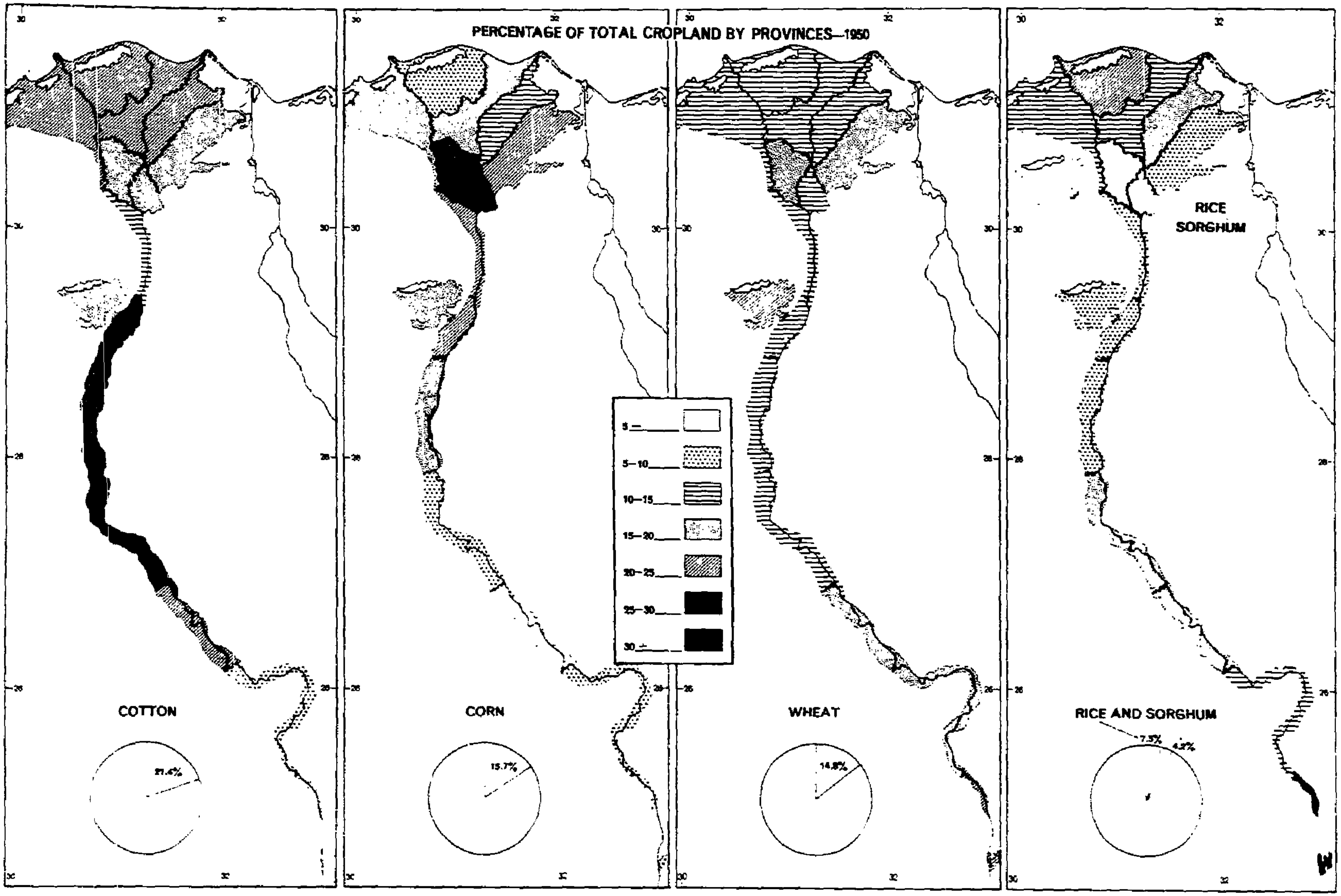
The fass, a heavy, three-cornered metal head on a stout three-foot handle, serves the purposes of hoe, spade, and pickax. The mingal is universally used by the small farmer for cutting his grain and his fodder crops.

MAJOR CROPS[9]

Grain

Egypt has long since lost its reputation as the granary of the Mediterranean; it no longer produces enough grain even to feed its own people. In recent years annual imports of wheat have run between 400,000 and 500,000 tons and those of corn have amounted to about 150,000 tons. Even so Egypt is still one of the great grain-producing countries from the standpoint of the proportion of its total cultivated area planted to grain and its yield per unit area. Every year, food-grain plantings (corn, wheat, rice, sorghum, and barley) occupy nearly half of the crop area (the total area planted to summer, autumn, and winter crops) and some years well over half. For the past twenty-five years the average annual production of corn has been about 1,300,000 tons from an average annual planting of 1,765,000 acres, and of wheat 1,280,000 tons from 1,567,000 acres.

The present shortages are due in the first instance to the disproportionate increase in population during the present century over the increase in land cultivated. Also, although grain is the principal item in the diet of the Egyptian people as a whole (the annual per-capita consumption is about 300 pounds, as compared with 165 in the United States), much of the area that might be


PERCENTAGE OF TOTAL CROPLAND BY PROVINCES—1950
COTTON
21.4%
CORN
15.7%
WHEAT
14.8%
RICE AND SORGHUM
7.5%
4.2%
RICE
SORGHUM
5 —
5—10
10—15
15—20
20—25
25—30
30 +

planted to corn, the most important grain crop, must be reserved for cotton. For the corn-planting season overlaps the cotton-picking season, and cotton is the crop on which Egyptian economy is mainly based. Wheat is a winter crop, and there is thus no conflict between it and cotton so far as occupation of the land is concerned. But some restrictions in the area permitted for wheat are imposed by the need of storing the Nile water (which would otherwise run freely during the winter) for summer irrigation of rice, sugar, and especially cotton.

Table 8 - Areas in Principal Crops in Percentages of Total Crop Area for Selected Years of High and Low Percentages in Cotton

Year	Cotton	Corn	Wheat	Sorghum	Rice	Beans	Barley	Sugar	Orchards	Clover	Crop area in 1000 feddans
1930	24.1	21.1	16.9	3.0	4.0	4.9	3.8	0.6	0.3	16.9	8633
1932	12.5	22.5	19.4	3.9	5.4	6.7	4.0	0.8	0.5	18.7	8735
1937	23.6	18.6	16.3	3.8	3.1	4.6	3.1	0.8	0.8	20.8	8358
1942	7.6	21.3	17.0	8.8	7.2	3.8	3.4	0.9	0.7	22.4	9274
1947	13.6	17.5	17.7	5.9	8.4	4.1	2.6	1.0	0.8	21.7	9166
1950	21.4	15.7	14.8	4.2	7.5	3.8	1.2	0.8	0.9	23.6	9225

The area planted to cotton each year is largely a matter of government decree, and its fluctuations in general correspond to anticipated market demand. In years of expected food shortage owing to import difficulties (as during the two World Wars), however, or years of serious water shortage, the amount of land on which cotton is permitted may be restricted in order that more food crops can be grown.

Corn and wheat together always occupy more than 70 per cent of the land planted to grain, with usually about 15 per cent more planted to corn than to wheat. Sorghum and barley, both of which are also used as bread grains, occupy less than a fifth of the grain-crop area, and rice normally occupies a tenth. However, because of its dependence on a copious supply of water at exactly the right time, the total area as well as the location permitted for rice may vary greatly. In years of low water rice may be severely restricted.

Grain yields on the whole are high in Egypt. The average yield of corn of 41.2 bushels per feddan (39.7 per acre) during the period 1935 to 1939 was the highest of any of the major corn-producing countries. The average for the United States for those years was only 25 bushels per acre. Egyptian yields have somewhat declined recently, owing, it is believed, to overcropping and shortage of fertilizers during World War II; the average for the period 1945 to 1949 was 34.6 bushels per feddan (33.4 per acre). Meanwhile the average in the United States for that period, as the resultof the extensive use of hybrid seed, had risen to 35.7 bushels per acre.[10]

Corn.

Not only is corn (called locally thura or dura shami) the leading food grain of the rural population, but its stalks are a valuable livestock food and its cobs an important contribution to the farmer's meager fuel supply. So important is corn that it now occupies annually between 1.5 and 1.8 million feddans, or about a fifth of the total crop area. (The average over the past 25 years was 1.7 million feddans.) Humans eat it mostly in the form of bread baked in thin, flat discs without leavening. Properly baked, this bread is long-keeping, and a single baking may supply a family for weeks.

The predominant autumn (nili) crop, corn usually occupies 90 per cent of the area cropped during this season. It is planted on land that has lain fallow for two months or more after the winter crop of clover or other grain has been harvested. Consequently planting must await the coming of the Nile flood. It cannot be started until the government, assured of a sufficient flow of water for storage for the next summer's cotton crop, issues the order.

When the order comes there is a great rush to get the seed into the ground. A considerable amount of water - all supplied by the perennial irrigation system - is required to get the dry, deeply cracked fallow into condition. Plowing usually begins about a week after the first watering. Planting time may thus vary from mid-July to early August, depending on when the flood arrives. Corn ripens in three to four months from the planting date, so that harvesting takes place in October or November. (A summer variety of corn, planted in May and harvested in July, is of little consequence, occupying less than 2 per cent of the total area planted to corn.) Corn is cut with a sickle (mingal), and the ears are husked and thrown into piles, where the kernels are beaten off with heavy wooden staffs.

Of the total area in corn, 70 per cent is in the delta and most of the remainder in the valley provinces north of the Asyut Barrage. Above the barrage, corn is largely replaced by sorghum as an autumn grain crop. The proportion of land in corn is highest in the southern part of the delta; it occupies more than half the total crop area in the provinces of Sharqiya, Minufiya, Gharbiya, and Beheira, and more than 20 per cent in Qalubiya. In the valley, Minya is the leading corn-producing province, but in Giza

and Beni Suef, also, corn usually occupies more than 20 per cent of the total crop area.

Wheat.

Although wheat (gamh) has long been second to corn among Egypt's grain crops, it has been grown for thousands of years, and there have been many times when its prodigious yield attracted the attention and the cupidity of foreign nations. Since cotton became the dominant crop under perennial irrigation the area planted to wheat has varied much less than has that planted to corn, because wheat is a winter crop and thus has no competition from cotton in normal years. The year-to-year departures from the average area of about 1.5 million feddans planted to wheat over the past twenty-five years have been slight as compared with those planted to corn.

Two types of wheat are grown, both mixtures of hard and soft varieties. The indigenous baladi is a short-stemmed wheat with densely packed, bearded heads of rough, irregular grains. Bread made from it in the European type of loaf is tough and rubbery, but the thin, pancake-like form is the usual type baked. The lindi variety, which was introduced from India toward the end of the last century, is much better both in yield and in bread-making qualities, and is now the dominant variety grown in the valley. It is, however, by no means of such quality as to compete with European and American wheat in the world market. Attempts at introducing European and American varieties so far have been without success; the seed germinates well and leaf growth is good, but very few ears form.

Of the total area planted in wheat, 62 per cent is in the delta, 18 per cent north of the Asyut Barrage, and 20 per cent above the barrage, where it normally occupies a fifth of the total crop area and is grown under basin irrigation. The provinces of Sharqiya, Gharbiya, and Beheira in the delta produce a third of the total wheat crop. South of the delta the Faiyum leads in area planted and production, followed by Girga, Asyut, and Qena provinces, in the order named.

Wheat occupies about a third of the land under winter crops and is grown throughout the country, under both perennial and basin irrigation. In no province is the wheat area less than 10 per cent of the total crop area, and in Minufiya and Sharqiya provinces in the delta, and in Faiyum in Middle Egypt, it is the main crop from the standpoint of area planted. The area planted is exceeded only by that in clover, the other principal winter crop, usually in the proportion of four to three. Wheat sowing begins in October in the southern part of the valley and continues northward to early November in the delta. In the perennially irrigated sections it usually follows corn or cotton. On land under basin irrigation it is simply sown broadcast on the mud left after the flood water has been drained off. If any covering is done it is by driving livestock back and forth over the broadcast. The land is then smoothed with a timber drag, usually pulled manually. Under perennial irrigation the land is divided for watering into plots bordered by low embankments, and the seed is sown broadcast on dry soil. Water is first let in

after the sowing operation is completed, and the land is then covered by plowing and dragging.

Wheat ripens in Egypt in five or six months from the planting date, and in the south harvesting usually begins in March. Except on a few of the large estates, where animal- or tractor-drawn reapers or binders have been introduced, cutting is done with a hand sickle. Mechanical threshing machines are used on some of the larger estates, but most threshing is done with the threshing sledge (norag) described above on floors of hard, sun-baked earth near the fields or in the village squares. When the norag is used the threshing operation is completed by hand winnowing.

Rice.

Among Egypt's grain crops, rice (roz or orz) ranks third in area and first in value per unit of measurement for local sale and export. The yield per unit area is among the highest in the world. The average for the period 1949 to 1954 was 1.54 daribas (3198 pounds) per feddan, or 3081 pounds per acre, as compared with 2334 pounds in the United States. This closely rivalled Japan's average during that period of 3360 pounds per acre and was materially exceeded only by Italy's 4582 and Spain's 4450.

Egypt is not, however, a large rice producer. The average area planted to rice during the period 1949-1954, although it occupied about 7 per cent of the average total crop area, was only 497,600 feddans, or 516,500 acres, as compared with the average of 2,189,000 acres in the United States. The average production was 1848.5 million pounds, as compared with 4547.8 million pounds in the United States.

The 5000 to 6300 cubic meters of water per feddan required for rice in Egypt is three or four times that required for cotton. Consequently, since rice is, like cotton, a summer crop and cotton is always given priority in water allotment, the area that can be planted to rice each year depends on the amount of water provided by the Nile flood of the previous year for storage in the Aswan Reservoir. In years of water shortage the government fixes the amount of land that can be planted in rice and assigns to each grower his proportion of the total. In 1931, for example, the area permitted was only 64,000 feddans as compared with 345,000 feddans planted the preceding year, and there have been years following particularly low Nile floods when rice cultivation was entirely prohibited as in the period 1900-1902.

Rice cultivation in Egypt was greatly expanded during World War II as the result of government measures to increase food-crop production by curtailing the amount of land permitted for cotton growing. The area in rice and the amount of rice produced both rose to more than twice the prewar averages and have since been maintained at those levels or better. The average area planted yearly during the ten-year period 1942 to 1951 was nearly 64 per cent higher than the average for the preceding ten-year period.

No such increase would have been possible, however, had it not been for additions to the Aswan Dam in 1934 and construction of the Gebel Aulia Dam on the White Nile in 1937. (See Chapter 5, Irrigation.) Although rice was introduced into Egypt from India as early as the beginning of the sixteenth century, the area planted to it was small as compared with that in other grain crops until these two major additions to facilities for storing Nile flood water were completed.

Egyptian rice is now generally of good quality and its high gluten content in particular has created a demand for it in the foreign market. At least 60 per cent of it, however, is consumed at home. Until about twenty years ago the rice grown, a mixture of Indian and Southeast Asian varieties, was of rather poor quality. But this variety has largely been replaced by Japanese varieties, introduced by the Ministry of Agriculture, of superior yield and quality, as well as quicker maturing, the latter a characteristic especially desirable in Egypt. The most popular Japanese variety is a pearl rice known as luli.

About 96 per cent of the total area planted to rice is in the delta, most of it in the northern provinces (in Daqahliya and Fouadiya it normally occupies a fifth of the crop area). Most of the remainder is in the Faiyum; in the valley proper it is of little consequence. Rice is an ideal crop for the northern delta provinces, where soil salinity is a constant problem. Its tolerance of considerable soil salinity and the fact that the large quantities of water used in its cultivation help wash out the salt accumulations from the soil combine to make rice especially valuable where land reclamation is in process. Even after the soil is conditioned for other crops, rice is introduced into the rotation more or less regularly to combat the recurrence of salinity. Although the greater part of the rice acreage is on such newly reclaimed land, in certain areas planting has taken place on older land, where rice has to some extent replaced cotton.

The older varieties of rice were sown in April and harvested in September, but use of the Japanese varieties has shortened the season to from early May to August. There is also an autumn variety sown in August and harvested in October, but it is grown only on the so-called "barari" land (previously uncultivated or only partially reclaimed land) on the northern and southern borders of the Faiyum depression, and never occupies more than 2 per cent of the total area in rice.

Some rice is now transplanted from seed beds, but most of it is planted by sowing the seed directly on the land that the crop is to occupy. The ground is first thoroughly watered, and then plowed in two directions at right angles to each other, leveled with a drag, and divided into small fields by low embankments. After a second thorough soaking, the water is drained off and the seed sown broadcast in the mud. Water is immediately let in to a depth of two or three inches and left standing for two or three days before being drained off. This watering is repeated at regular intervals until the grain begins to ripen. The crop is cut with hand sickles and most of it is threshed by beating and winnowing. The rough rice is taken to mills in the towns for hulling.

Sorghum.

Sorghum (dura baladi, dura oweiga, or dura raffi'a) is grown only in the Nile valley, where it is the principal supplement to corn in the rural diet. The hotter, drier climate of the valley is more favorable to its growth than is the delta climate. Sorghum compares well with corn in food value; although its fat content is somewhat lower, it is considerably higher in protein. The entire crop, a yearly average of between 3 and 4 million ardebs (450, 000 to 600, 000 tons), is consumed on the farms. The kernels, beaten out of the heads much as corn is beaten from the cobs, is fed whole to livestock and poultry. For human food it is ground into meal, from which cakes are made much like those made of corn. The stalks are used for summer fodder.

Although most of the sorghum is planted in April and harvested in July, about 10 per cent, chiefly in the Faiyum, is planted in August and harvested in November. South of the Asyut Barrage it is the leading grain crop, except in Qena province, where the area planted to sorghum is exceeded by that in wheat. Asyut and Girga provinces have about half the average total area planted to sorghum - around 100, 000 feddans each. The average yield of 8. 28 ardebs per feddan (2480 pounds per acre) is about 25 per cent higher than that of corn and is believed to be the highest in the world. In a country where food is in such short supply, it is not surprising that sorghum should replace corn wherever the climate is best adapted for its growth.

Barley.

Although barley (sha'ir) is an ancient crop in Egypt, it is the least important of the country's grain crops, and the area planted to it has been declining for many years. In recent years it has averaged less than 200,000 feddans, or about 7 per cent of the total area in grain. Since it is used mostly to feed horses and mules, of which there are few in the rural areas, the farmer is little interested in it.

Egyptian barley is of good quality for brewing and at one time was an important export for that purpose. During the peak years of 1915 to 1917 an average of more than 400, 000 feddans was grown, principally for export to British breweries. None is exported at present; whatever is not used for stock feed goes to local breweries, mainly in Cairo and Alexandria. The breweries are owned by Europeans, Greeks in particular, and the European residents are almost exclusively the consumers of the product, since alcoholic beverages are prohibited to Moslems.

Barley is a winter crop sown in November and harvested in March and April. Its growing season is thus somewhat shorter than that of wheat. The principal areas of its cultivation are widely separated. Beheira province in the delta, and Qena in the upper valley, contribute, respectively, 25 and 20 per cent of the crop, and Aswan and Sharqiya about 20 per cent each.

Clover

The clover of Egypt (berseem), the quick-growing, deep-green, white-flowered *Trifolium alexandrinum*, is a variety peculiar to the country and is perhaps of even more ancient ancestry there than wheat. Its dual purpose as stock food and fertilizer makes it indispensable in the agricultural routine in all parts of Egypt. Nearly 2,000,000 feddans are planted to it each year, or somewhat more than 20 per cent of the total crop area, a greater proportion than that allotted to any other crop. In the delta it occupies more than a fourth of the total crop area and in the northern provinces of the delta more than a fifth; only in the southernmost provinces of Aswan and Qena is it largely replaced by other legumes.

Clover is Egypt's staple stock food, pastured or cut and fed green from November to May and to some extent dried for summer fodder. Consequently every farmer, large or small, allots a space to it commensurate with his stock-feeding needs, and it has a regular place in every crop rotation (every other year in the biennial rotations and usually twice every three years in the triennial rotations). (While ensilation of clover might solve the problem of the scarcity of green summer fodder, which has been a major obstacle to the development of the dairy industry in Egypt, probably only the larger landowners could afford the cost of building silos. The feasibility of introducing the pit method, with preservatives added, now widely used in some of the northern countries of Europe, merits investigation.)

Although clover is rarely plowed under for green manure, its faculty of fixing nitrogen from the atmosphere has played an important part in the maintaining through the ages the proverbial high fertility of the valley and delta soils. Whether or not the average Egyptian peasant knows anything of this faculty, his regular inclusion of clover in his crop rotations is evidence of its importance as a revivifier of his soil. It is regularly used, too, as a first planting when newly reclaimed land is put in condition, and more particularly to follow rice where saline and poorly drained soils are being prepared for growing other crops.

Clover is a winter crop, sown usually in October under basin irrigation and in November under perennial irrigation. So rapid is its growth that it may be knee deep in fifty days, and it is so luxuriant that the average yield is six to eight tons per feddan. It is generally pastured or cut several times before plowing for summer crops begins. Where basin irrigation is practiced its cultivation is a simple matter of scattering the seed on the mud immediately after the flood water is drained off. Under perennial irrigation water is let in after the land has been plowed and diked as for other crops, and the seed is scattered before the water has been absorbed by the soil. Subsequent watering is given as needed.

Sugar Cane

The Arabs introduced sugar cane (gasab) from India early in the eighth century A.D., and by the end of the ninth century a thriving industry of molasses extraction and sugar making was being carried on in numerous small mills. Egypt was one of the first countries to perfect the art of sugar refining and the use of sugar in candies and other confections. The process as first developed consisted of straining the cane juice through linen filters and then boiling it and pouring the syrup into shallow earthern pans for cooling and crystallizing. Egg whites and fowl fat were soon also employed for defecation, and spindles for controlling the concentration of the juice. The spindle was perhaps first used in sugar making in Egypt. [11]

Until its incorporation in the Ottoman Empire in 1517, Egypt was for centuries the major source of the sugar supply of Europe and southwest Asia. In the general decline of agriculture following the Turkish invasion cane growing almost ceased. But even if it had not, the shifting of the east-west trade routes away from Egypt cut the country off from its former close contacts with the European market, and with the development of the sugar industry in Brazil and the West Indies, sugar was no longer the luxury that had made its export so profitable to the Egyptian refineries. The decline in cane growing was probably due, however, as much to neglect of irrigation works as to the failure of the foreign market, since the water need of cane is only a little short of that of rice. By the end of the eighteenth century cane growing had all but vanished from the delta and the area still planted in the valley was so small that most of the sugar consumed was being imported.

Mohammed Ali (Governor-General from 1805 to 1849) early turned his attention to the restoration of sugar as an export product. The perennial irrigation works he constructed in the delta were undertaken for sugar growing, as well as for cotton. But cotton soon became his major interest, and although there was a more or less steady development of cane cultivation and the building of new sugar mills, cane was not again established as a crop of any real importance until the late 1870's.

The possibility of making cane profitable again came to the fore when, after the close of the American Civil War, Egyptian cotton, which had profited greatly from the blockade of the Confederate coast, was once more faced with competition by the American product in the European market. Consequently Ismail, grandson of Mohammed Ali, Governor-General from 1849 to 1867, and Viceroy (Khedive) from then on until his death in 1879, made a great effort to expand cane cultivation, particularly on his own vast domain, which comprised about a fifth of the total cultivated areas of the delta and valley. The 268-kilometer Ibrahimiya Canal, opened in 1873, was constructed mainly to supply irrigation water for cane plantations on his estates in the lower valley west of the Nile and in the Faiyum. Pumps were installed to provide summer water for plantings in the southern part of the valley; sixteen sugar mills were equipped with up-to-date grinding and refining equipment to handle the crop; systems of rail lines were laid down

for carrying the cane to the mills; and new varieties of cane were introduced from the West Indies.

By 1877 the area in cane had reached about 71,000 feddans. But Ismail was notorious for his prodigalities, and his expenditures for the development of the sugar industry were no less lavish and ill considered than were his other extravagances. By the last years of his reign his sugar industry was in such financial difficulties that it was forced into liquidation and was split up among a number of small private organizations. Foreign competition, too, was at this time invading even the local market, particularly as the result of the development of government-subsidized sugarbeet growing in Europe. Meanwhile the market for cotton was once more on the upgrade. Owing to this combination of factors, by 1882 the area in sugar had shrunk to 20,000 feddans. With cotton coming more and more into favor as an industrial crop in the lower valley, sugar was restricted to the upper provinces.

Conditions of temperature, sunshine, and soil, however, were so favorable for the growing of cane in the Nile valley and the potentialities of sugar as an industrial crop to supplement cotton had been so well demonstrated that cane cultivation was never completely abandoned. To keep the industry alive, the sugar mills and refineries were consolidated in 1897 in a General Sugar Mills and Refineries Company of Egypt. The new company reorganized the industry and planted considerable cane on holdings within easy access of the mills.

Many ups and downs followed. In 1898 and 1899, when sugar production in the West Indies was seriously interrupted by the Spanish-American War, the area under cultivation rose to 86,500 feddans. Ten years later world overproduction had forced it down to 38,500 feddans. Then during World War I it again expanded; in 1920, when the postwar depression struck, 64,000 feddans had been planted. By 1930 the area had fallen to 30,000 feddans.

Such fluctuations in the area planted to an industrial crop can be a serious matter in a country whose economy is based on its exports of a few agricultural products and whose cultivable area is so small in relation to the population dependent on it. To avoid such crises, the government in 1930 worked out an agreement with the Sugar Mills and Refineries Company whereby the company was to be protected from foreign competition in the local market by a tariff which effectively shut out imports of refined sugar. In return, the company agreed to attempt to supply the local market from the local crop as far as possible and to import raw sugar for refining only in years of local crop shortage. Both the company and the government engaged to carry on research with a view to improving cane yield and increasing its sugar content.

Since this arrangement was made there has been slow but steady increase in the area planted in cane. It reached a high of 96,000 feddans in 1945 and since then has averaged around 90,000 feddans, or a little less

than 1 per cent of the total crop area and 2.5 to 3 per cent of the area under summer cultivation. There has also been considerable improvement in yield. Varieties introduced from Java and Jamaica are now mostly grown, and since 1940, the Technical Service of the Ministry of Agriculture has had notable success in developing strains of better yield, higher sugar content, and with disease resistance. The average cane yield in recent years, nearly 700 qentars per feddan (35 tons per acre), is the third highest in the world, following Hawaii's 66 tons per acre and Java's 49-56 tons. (Louisiana's average is between 15 and 20 tons, Puerto Rico's 27, and Cuba's 17.) During the five-year period 1947-1951, 195,000 tons a year of raw sugar were milled and 86,500 tons of molasses.

Cane requires a heavy soil and for best results continuous hot weather with plentiful sunshine and little humidity; an abundant and regular supply of water during the growing season (its daily requirement of 50 to 60 cubic meters per feddan is only a little short of the 65 cubic meters required for rice); and good drainage, because of the effect of ground water in lowering soil temperature. Climatic conditions in theNile valley, and particularly in the upper valley, are ideal for it, as are the canal or pump irrigation in the perennially irrigated sections of the valley. Little cane is grown in the cooler and slightly more humid delta, with its difficult drainage problems, and what is grown there is of an inferior quality.

Because of superior climatic conditions in the southern part of the Nile valley, cane has become the principal industrial crop of the four southernmost provinces, and is now little cultivated north of the province of Beni Suef. The plantations in Qena province, where cane is the leading summer crop, contribute about 60 per cent of the country's total production. The sugar mills at Kom Ombo (Aswan province) and at Armant and Nag 'Hammadi (Qena) produce 75 per cent of the raw sugar output, and cane growing is largely concentrated near these mills and the mills at Qurqas and Sheikh Fadl (Minya).

Cane cultivation in these districts is practically a year-round activity, with hundreds of thousands employed on company estates, state domains, and privately owned farms and in the sugar mills. The mills, with their modern equipment and methods and their staffs of technicians and researchers, may have a far-reaching sociological effect on the Egyptian farm population. They provide the cane farmer with technical advice for the improvement of his crop. Also, by furnishing residential quarters with educational and recreational facilities for their employees, they bring to his door a type of cultural center with which other farmers have little or no contact.

Some of the land companies organized for cane growing make much the same contribution. The Wadi Kom Ombo Company, which supplies the cane for the Kom Ombo mill, is a notable example. It has reclaimed some 38,000 feddans of desert wilderness on the right bank of the Nile, about 48 kilometers north of the Aswan Dam, by pumping water to them directly from the Nile, Cane growing, to which the greater part of the area is devoted, is a highly organized enterprise, carried on with technicians and researchers, and quarters provided for the workers.

Cane is a summer crop, but the preparation of the land for it usually begins in February. The land is plowed two or three times, then furrowed about fifteen centimeters deep with the plow or the fass, the traditional Egyptian hoe. The cane sections used for propagating are planted in double rows in the furrows in March and April. Watering follows immediately, and is repeated at fifteen - or twenty-day intervals until October. The crop is cut about ten months after the planting date, usually beginning in December. The mills buy the cane from the growers. Camel caravans, motor trucks, and sailing vessels take it to central collecting points, from which it goes to the mills by narrow-gauge railroad. The raw sugar from the mills all goes to El Hawamdiya, about 10 miles south of Giza, for refining.

The cane stubble is generally left in the ground to sprout for a second (ratoon) crop, which is harvested ten or twelve months later. A third crop may also be allowed to sprout from the stubble, but the yield is poor, and this is not common practice. Because sugar cane tends to exhaust the soil, heavy fertilization with phosphate and nitrate and a long period of soil revitalization between crops is necessary. In the sugar districts cane is the center of the crop rotation, as is cotton in the cotton-growing districts. As a rule, soil that has been in cane is not replanted to it for three or four years, with a fallow period and plantings of leguminous crops intervening.

Other Food Crops

Peanuts and Sesame.

Peanuts (fool sudani) and sesame (simsim) are supplementary food crops of some importance. Both are eaten directly (sesame seed mainly in confections), but they are of equal value for the cooking oil extracted from them. Both are summer crops. The total area grown is small, an average for the two combined of around 53,000 feddans (nearly 25,000 in peanuts), or only about 1.5 per cent of the total area in summer crops. The yield is high. The average peanut production is 9.3 ardebs per feddan or about 2750 pounds per acre as compared with the United States' high of a little over 1000 pounds per acre in the Virginia-North Carolina peanut-growing area. The average yield of sesame seed, 3.4 ardebs (about 500 pounds) per feddan, is believed to be the world's highest. The entire crop of both peanuts and sesame is locally consumed, and in most years have to be supplemented with sizable imports, mainly from the Sudan.

Both peanuts and sesame are grown throughout the Nile valley, but areas of heavy concentration are limited to a few districts. Nearly 70 per cent of the peanut crop comes from the delta and 60 per cent of it from the eastern margin of Sharqiya province, where the light, sand and alluvium mixture which is most suitable for it is found. The highest yield, an average of over 19 ardebs (about 5830 pounds) per feddan or more than double the overall average, is, however, that of Asyut province. Eighty-five per cent of the sesame crop comes from three provinces: 35 per cent from Sharqiya, 30 from Asyut, and 20 from Girga.

Fenugreek.

Fenugreek (helba), Trigonella foenumgraecum, a leguminous herb with many-seeded pods, is an old basin-irrigation crop. The succulent plant makes excellent fodder. The aromatic seeds are much used in cooked and uncooked vegetable dishes; so much so that the annual crop, an average of over 200,000 ardebs (about 30,000 tons) is consumed locally. Fenugreek is so popular that it is now grown under perennial as well as basin irrigation and throughout the delta and valley and in the Faiyum. Seventy per cent of it is grown, however, in the upper valley, mainly on basin-irrigated land in Girga and Qena provinces. The seed is planted in November and the pods are ripe in 60 or 70 days.

Vegetables

A great variety of vegetables is grown in Egypt - all the vegetables common in the United States and many others - and the yield is in general high and the quality good. Except for onions, however, vegetables have only a very limited place in the rural diet. Although every farmer, whether owner or tenant and no matter how small the holding he works, grows a few, beyond an occasional dish of greens he takes little interest in them except as flavoring in the common rural diet of corn bread and beans.

The total area in vegetables is estimated at no more than 250,000 or 300,000 feddans - about 3 per cent of the total crop area. The only commercial truck farms, other than onion farms, are around the urban centers, and their production of a number of items for which there is the greatest demand has usually to be supplemented by rather heavy imports. Onions and potatoes are the only vegetables exported in any significant amounts. Potatoes are exported for trade purposes and not to dispose of a surplus; nearly 60,000 ardebs (about 300,000 bushels) were exported in 1950, for example, but close to three times that amount was imported.

Onions.

The onion, one of Egypt's oldest export crops and still one of the most profitable, until recently was second to cotton in export value - although a low second. That place is now taken by rice, but 30 to 40 per cent of the onion crop is still normally exported. Of an average annual crop of 226,000 tons harvested during the five-year period 1947-1951, about 82,500 tons of raw onions and 660 tons in dehydrated form were exported to a value of £E 2,091,324 (about $8,630,000).

Onions are Egypt's leading vegetable crop. The average of 36,000 feddans grown in the period 1947-1951 was nearly fifteen per cent of the average area in all vegetables. Besides being grown for export they are an article of practically daily consumption in the diet of the agricultural population, and consequently are grown almost everywhere throughout the Nile valley and delta. The commercial crop, however, is confined mostly to the valley (90 per cent of the total crop is produced there in 80 per cent of the total area planted). Of the crop grown for export, 85 per cent comes from the upper valley; Girga and Minya provinces contribute 30 per cent each and Asyut 15 per cent. The onions grown in the valley for export are a reddish Spanish variety. The average yield there of 150 qentars per feddan (about

15,000 pounds per acre) is one of the highest in the world. During the years 1947 to 1951 an average of only about 6000 feddans were grown in the delta, and half of those were in Beheira province. The yield in the delta is, also, much lower than in the valley and the quality far inferior.

Onions are a winter crop in Egypt, and since they can be harvested two or three months after planting, two crops a season are frequently grown. At harvest time the countryside is redolent with the scent of the onion trains carrying the crop to the delta cities and ports. Export is under government control to ensure maintainance of high quality and careful grading.

Other important vegetable crops.

Next to onions, tomatoes, potatoes, watermelons, and muskmelons are the crops to which the largest proportion of the truck-farming area is devoted. During the period 1947-1951 they occupied together an average of 13 per cent of the average total area in vegetables - tomatoes nearly 19,000 feddans, potatoes 12,500, and melons about 9000.

Practically the whole of the potato crop and over 90 per cent of the tomato crop are grown in the delta provinces and Giza. Nearly 80 per cent of the melon crop comes from the delta and about a third of it from Beheira province; but there is also considerable melon production in the up-valley provinces of Asyut, Girga, and Qena, where a time-honored practice persists of growing them on flats and bars exposed on the Nile floor after the annual flood has subsided.

Prospects for truck farming.

Since the climate of Egypt is suitable for growing a wide range of vegetables throughout the year wherever irrigation water is available, truck farming for the European market might prove to be highly profitable. But large scale truck farming dates no further back than World War I, when the shortage of imported supplies gave it its first impetus. Although by 1930 it came to occupy about 145,000 feddans, by 1940 the area had declined to only a little more than half that, owing to lack of any real interest. During World War II, when the shortage of food imports and the decline of the cotton market led to and sometimes enforced the growing of more food crops, the area in vegetables, including onions, rose to nearly 400,000 feddans, but by 1950 it had again fallen off by more than 20 per cent. The lack of adequate means of rapid transportation would seem to preclude any sizable expansion except within easy access of local urban markets.

Fruit Growing

The climate of Egypt, the soil in most sections, and the available labor supply favor the growing of a wide range of tropical and subtropical fruits. Many of those are of high quality, and their early ripening (citrus fruits begin to ripen in September and continue into April) would insure a good demand for them in the European markets if they were in sufficient supply for export. The total area in orchards is still extremely small, however, in relation to the country's potentialities.

Even so, during the past twenty years there has been considerable expansion of the area in orchards, for which government aid in the form of prohibitive tariffs on fruit imports is largely to be credited. The total area in fruit at present is estimated at 100,000 feddans as compared with only 33,000 in 1930, with the increase largely in citrus fruits. But production, except for dates, is still so low as to make prices prohibitive except to the well-to-do.

There are a number of reasons why advantage has not been taken of the country's exceptional potentialities for fruit production: among them, the heavy original capital outlay and the long wait for returns required as compared with those for other crops; the shortage of personnel with the necessary technical training and experience needed for good orchard husbandry; the present limited local market because of the poverty of the great majority of the people; and the high cost of grading, packing, and transport, especially if foreign markets are to be sought, but even for the local urban markets in a country of such continuously high temperatures.

Large-scale orcharding is limited to districts within close range of the larger urban centers. The principal orchard area is the southeastern delta, from which the Cairo markets are within easy reach on the one side and those of the Suez Canal Zone on the other. There the provinces of Qalubiya and Sharqiya have together some 30 per cent of the total orchard area. The second important concentration is in western Beheira province near Alexandria, with about 20 per cent of the total orchard area. Above the delta the Faiyum leads the other provinces in land in orchards. It produces 30 per cent of the lime crop and a number of other high quality fruits. Citrus fruits are also grown in the Palestinian district of Gaza, of which a section is now under Egyptian administration. These are in particularly good favor in European markets and until recently were re-exported from Egyptian ports.

Citrus fruits.

Citrus fruits, mainly oranges (bortoqal), tangerines (yusef effendi), and limes (leimoon) lead in area. The sweet lemon is also grown to some extent and grapefruit has recently been introduced. The 6,000,000 orange, 2,500,000 tangerine, and 1,000,000 lime trees estimated as in production occupy about 35,000 feddans, or 40 per cent of the total orchard area. The annual production of around 300,000 tons is barely sufficient even for the present local demand, and at times oranges and lemons are imported in spite of the high tariff.

Grapes.

The grape (ᶜinab) may well be second in antiquity only to the date palm among Egypt's fruit crops. Before the Arab conquest grapes were extensively grown and had long supplied a widely famous wine industry; but wine making was discontinued when Islam, with its prohibition of alcoholic beverages, became the official religion, and the growing of grapes consequently greatly declined. Thenceforth, until the recent revival of wine making, the only types grown were a wide range of varieties of table grapes. During the past few years there has been a notable expansion in grape growing. In 1950 there

were 19,000 feddans in vineyards as compared with 8000 in 1940. Many of the new vineyards supply grapes to wineries, recently established by Greeks in Alexandria, which cater to European residents. The greatest concentration of vineyards is now in Beheira province, which has 45 per cent of the total vineyard area.

Dates.

Dates (balah) are apt to be thought of as a staple crop of the oases of Egypt's Western Desert rather than of the Nile valley and delta; but even in the valley and delta the towering date palm (some varieties grow as high as 80 feet or more in Egypt) is everywhere a feature of the landscape - in groves at the desert edge and in the sand-dune districts along the Mediterranean, along river and canal banks, in village squares, and even sparsely scattered in the fields. In city parks, promenades, and drives they lend beauty to the urban scene, and make a substantial contribution to their upkeep through the sale of the fruit.

There are probably more than 6,000,000 trees in the valley and delta provinces - 44 per cent of them in the delta, 40 per cent in the Middle Egypt provinces of Giza, Faiyum, Beni Suef, and Minya, and 16 per cent in the four southernmost provinces. The average annual production of 170,000 tons is second only to Iraq's 300,000 tons among the date-producing countries of the world.

Most of the date crop is consumed in the country. Even the high-quality Saidi date of the desert oases, for which a place of first rank could be made in the world market if it were properly packed, gets no further than the city markets of lower Egypt. The only exporters of any importance are Greeks and Italians, who by careful handling and packing of a date grown along the eastern border of the delta and known as "amri" have created a good demand for it in European markets.

There are many varieties of Egyptian dates, some of which are seedlings and others, known as varietals, reproduced vegetatively. Varietals, which have been given distinctive names because of their superior quality, are propagated from trunk offshoots to ensure that they will produce fruit true to the parent variety. Seedlings are grown from pits; their fruits usually vary more or less from those of the parent tree and may be of poor quality, although fine and even superior types are sometimes produced.

Varietal culture predominates in the delta and in the adjacent valley province of Giza, where there has long been a strong demand in the urban markets for high-quality, named varieties. It is also practiced in the valley above the Aswan Cataract, although less extensively than before the Aswan Reservoir flooded a long stretch of the valley. Varietal culture there is the result of the discovery of certain varieties especially adapted to this hottest and driest section of the valley, and particularly of a variety known as "Ibrimi," whose abundant large, dry fruits are of excellent quality and stand well the long trip down to the markets of the delta cities.

From the Aswan Cataract to southern Giza province and in the Faiyum, seedlings are mainly grown, although there may be an occasional varietal grove on the estate of a well-to-do landowner. Why propagation by seedling should prevail here is not too well understood, but it is probably to be accounted for in part by the fact that, in spite of the large number of trees (about 3,500,000 in the valley proper and 500,000 in the Faiyum), dates are grown there more as a sideline than in the delta and are seldom, if ever, shipped to the delta markets. The farm and village population provides a good and quick market for the entire crop, and quantity is more important than trueness of variety or even high quality.

Date cultivation consists mainly in providing the trees with as adequate a supply of water as is possible after the needs of field crops have been met. Where canal water can be brought to the trees by gravity, they are watered by flooding or by letting water into ditches dug around them. Elsewhere, as on the edge of the alluvial land, or on river and canal banks, and especially in the extreme upper valley, primitive water-lifting devices and in some of the larger groves, steam pumps may be used. The date palm is tolerant of considerable soil and water salinity and in the sand-dune districts along the Mediterranean where brackish water is found at depths of from four to five meters, it is a common practice to dig a conical hole down to moist sand, set large offshoots or nursery-grown trees in the bottom, and leave the hole to be filled up with the drifting sand. For such plantings no watering is necessary.

Although there is little actual cultivation of the date palms, where they are not too closely set it is a common practice to grow an under crop, usually of grain or clover. Whatever nutriment the roots of such a crop add to the soil is about all the fertilizing the tree gets. The results obtained where phosphate has been applied experimentally show that chemical fertilizers could be used with profit.

March and April, when the date palm flowers in Egypt, is a time of much activity wherever the tree grows. Male and female flowers are borne on separate trees, and although there is a tendency in some parts of the seedling areas to leave pollination to the wind, for good fruiting hand pollination is necessary. Since the female flower is receptive for only a few days, the trees must be gone over several times to catch the flowers when they are at the height of their vitality. The work is usually done by boys, who commonly climb the trees without ropes or girdles.

Annual pruning is also a general practice because full sun exposure of the fruit bunches is needed for sugar development and ripening and also because the leaves are needed for various purposes, owing to the scarcity of wood. Large numbers of leaves are cut off, and in Lower Egypt where the summer heat is less intense than in the upper valley, there is also a considerable practice of cutting away the leaf base and the layers of sheath fiber around it, in order to expose the trunk to the greatest possible degree of heat penetration.

The whole leaves are used for fencing, for roof top palisades, and to cover the joists under the layers of clay with which floors and roofs are commonly covered. Crates, racks, furniture, and the like are made from the heavy midribs. The pinnae, stripped from the ribs, are put to many uses, most important of which is for flat braids that are sewn together spirally to make the carryall baskets used by the peasants throughout Egypt. The tough sheath fiber is spun into cordage and rough rope. Strong cord and rope is also made of the fibers macerated from the fruit stalks and stems. Finally the palm trunks themselves are used for floor and roof joists and other building purposes. A supplementary source for timber, lumber, and packing material is the "doum tree" of Upper Egypt, a broad-leafed palm which bears a hard, large-stoned fruit with a thin layer of fibrous, sugary meat. Its stone is much used for making buttons.

Date picking begins in June and July in the upper valley and continues into late August and even later in the delta. Since most of the crop goes to the consumer shortly after picking, there is little drying and packing, except where dates are grown for export or where the local market calls for a superior product that keeps well. The principal exceptions are the oasis dates, which must be sufficiently cured and well-enough packed to survive the long desert journey by camel to the valley and delta markets, and the dates grown for export on the eastern border of the delta, mentioned above. In the urban markets fresh dates picked in the hard-ripe state are in great demand. Some preserving is done of the softer varieties. A favorite method is to spread them in a drying yard until they are soft and sirupy and the stone can be easily removed, and then to work them into a paste which, after having been spread out again in the hot sun, is reworked and packed into unglazed earthen jars. The jars are then sealed with a cover of cotton and a layer of wet clay.

Other fruits.

Other fruits of some importance are the mango (manga), guava (gawafa), pomegranate (nomman), banana (moz), and fig (teen).

Of these the mango is generally considered to have the best prospects for development as an export crop, and the plantings have been increasing rapidly in recent years. The area in mango groves, most of them in Giza, Sharqiya, and Beheira provinces, was 9121 feddans in 1951, as compared with only 3347 in 1945. Of the numerous varieties grown many are of such high quality that a selection from them has been recently introduced into Florida for crossbreeding purposes.

Guavas are produced in abundance. It is estimated that there are well over three-quarters of a million trees. The fruit ripens in late summer and is mainly consumed fresh. There are nearly 400,000 pomegranate trees, grown chiefly in the Nile valley. Manfalut district in Asyut province is particularly noted for its fine fruit. The Egyptian banana is small but of good quality. Banana plantings, most of which are in Beheira, Minufiya, and Qalubiya provinces, have also greatly increased in the last few years; in 1950 they occupied 7400 feddans, as compared with 2916 in 1945. The area in fig orchards is small and has fluctuated greatly in recent years; it was 2058 feddans in 1930, 4739 in

1940, and 2478 in 1950. The principal fig-growing districts are in Qalubiya province in the delta and in Faiyum. There is little consumption of figs at any great distance from the orchards; the varieties grown are extremely perishable and the rapid transport facilities and careful packing that would be needed for extensive distribution are lacking.

Apricots (mishmish), pears (kommathra), peaches (khokh), plums (barqooq), and apples (teffeh) are grown, but the total number of trees is small and the fruit, except for apricots, of poor quality. Faiyum is noted for its prickly pears (teen shoki) and olives (zeitoon).

LIVESTOCK

Livestock raising is a minor occupation and probably will never be an important agricultural industry. So great is the pressure for food and commercial crops, that there is little room for the fodder crops that would be required for a livestock industry of any magnitude. Some development may take place, however, if the small farmer can be induced to shift from his time-honored two-year rotation to the three-year rotation now widely practiced on the larger holdings (greatly to the benefit of soil maintenance and crop yield). Berseem (the quick-growing Egyptian clover), the principal fodder crop, is a major item in all crop rotations. On the farms the summer stock feed is mainly chopped straw and horse beans, and in the autumn corn stalks cut green or fed after the ripe ears have been removed. During the winter and spring the stock is either fed freshly-cut clover within the farmstead walls or tethered or hobbled out to pasture on it. Clover is seldom stored for summer feeding, although it would make excellent hay or silage.

This does not mean that Egypt is a land of no livestock. In fact the number in most categories is large for a country in which there has been practically no development of stock raising as a specialized agricultural industry. Table 9 gives in round numbers the count in the last census (1947) and the increases and decreases during the preceding two decades.

Although livestock have increased in the past two decades, the growth has little more than kept pace with area under perennial cultivation, except for cattle and buffaloes. The Egyptian farmer is interested in these chiefly as draft animals for working his land rather than as producers of milk and meat, but because they serve the dual purpose as both milkers and draft animals, the females of both are kept and the males sold for slaughter. As draft animals, cows and buffalo cows are an essential part of the equipment of all but the smallest farmers, whether owners or tenants, but the average farmer has no interest in increasing the number of these beyond his need for power, or in improving the quality of his stock. His only concern is that they be hardy and require little care.

Table 9 - Livestock in Egypt (in thousands)

	1927	1937	1947
Cattle	739	983	1321
Buffaloes	757	956	1240
Donkeys	750	1142	1125
Camels	179	154	196
Horses	37	31	27
Mules	21	22	12
Sheep	1232	1918	1875
Goats	622	1310	1475
Pigs	20	36	50
Totals	4357	6552	7321

Only on a few of the larger estates has there been any movement toward specialization in raising cattle solely for dairying or meat production, or improvement of stock for these purposes. The government has, however, recently established a stud center with the hope of gradually inducing the farmers to improve the meat- and milk-producing quality of their stock.

Buffaloes and Cattle

The water buffalo (gamoosa) is the most popular farm animal. Hardy, resistant to disease, well adapted to the climate, and of gentle disposition, it works well whether pulling a plow or turning a water wheel. Not only has it greater endurance than the cow but it gives more and richer milk. Although less numerous than cows, buffaloes contribute about 65 per cent of Egypt's milk production. The Egyptian cow (baqara) performs the same tasks as the buffalo on the Egyptian farm and the two are frequently harnessed together. The average annual milk production is only between 2500 and 3000 pounds as compared with about 5000 pounds in the United States, but the butter content of the milk averages eight per cent as compared with a little over five per cent in the United States.

Sheep and Goats

The raising of sheep (ghanam) and goats (ma'iz) is a side line which provides the farmer a secondary cash income, as well as wool and hair for weaving and a supplementary milk supply. About 10 per cent of these animals are raised by nomads outside the valley and delta, and most of the remainder in the farmers' courtyards, although a few flocks are to be seen on some of the larger holdings. Both are more popular in the valley than in the delta; although Lower Egypt has nearly 60 per cent of the total land under cultivation, it raises only about 34 per cent of the sheep and 20 per cent of the goats. Sheep are raised mainly to be sold for meat. Their wool is of poor quality and is mostly used for local weaving and knitting. Goats are raised primarily for their milk. The greater part of those slaughtered are consumed locally, and their hair is mixed with wool for local weaving.

Pigs

Pigs (khangeer) are raised only in very small numbers. Since the Moslem religion prohibits the production as well as the eating of pork, they are raised exclusively by the Copt population and are consumed by them and by residents of European origin. The local supply is insufficient and a good deal of preserved and processed pork is imported. Pig raising is carried on principally in the valley provinces of Qena (45 per cent of the annual production), Asyut (15 per cent), and Minya (8 per cent), since the rural Copt population is chiefly concentrated in these provinces. Considerable numbers of pigs (about 10 per cent) are raised within town and city limits, particularly in Cairo, Alexandria, Port Sa'id and Ismailiya.

The Meat and Dairy Supply

In spite of the low average per capita consumption of meat and dairy products in Egypt, production of neither is sufficient to meet local demand. Domestic dairy products are in fair supply in the rural sections only. The average annual production of buffalo, cow, and goat milk is about 20 million qentars (nearly 2 billion pounds), or less than 100 pounds per capita, compared with nearly 400 pounds per capita production of dairy products in the United States. It is estimated that 60 per cent of the milk produced is churned into butter, 30 per cent made into a white, whole-milk cheese, and only 10 per cent drunk as fresh milk. Butter and cheese making is mainly primitive, and the products consequently keep poorly and are largely consumed on the farm or in the nearby villages. In only a few districts do creameries and cheese factories manufacture for the urban centers, and the town and city supply is consequently short. [12]

The greater part of the domestic meat supply is furnished by the animals that the peasants either slaughter for sale at the village markets or sell on the hoof - their surplus cattle, buffaloes, and goats, and the sheep raised for that purpose. Camels are also slaughtered for meat. The government provides a number of well-distributed slaughter houses, and the meat from

these is certified for sale. Meat is eaten fresh killed throughout the country. The butcher shops display dressed carcasses that are delivered daily. The consumption of meat in any form is largely confined to the towns and cities. The small farmer cannot afford to buy meat, except for an occasional piece of camel flesh, and rarely eats any of his own slaughtering, except on festive occasions. At that, the domestic supply is far short of the demand, as will be seen by comparing Tables 10 and 11.

Table 10 - Animals Slaughtered (in thousands)

	1949		1950		1951	
	(1)	(2)	(1)	(2)	(1)	(2)
Steers	90	53	91	55	98	50
Cows	113	23	113	23	111	25
Calves	1079	381	1082	383	792	425
Buffaloes	106	46	150	50	172	58
Sheep	2174	543	2233	553	1834	533
Goats	374	31	378	26	1083	25
Camels	75	44	71	48	56	46
Pigs	26	26	30	30	31	31

(1) Total slaughtered; (2) Slaughtered in public abattoir.

Table 11 - Livestock imported (in thousands)

	Cattle	Sheep	Camels	Goats
1949	33	131	14	24
1950	41	156	13	28
1951	51	127	9	10

The total value of the livestock imported in 1951 was about £E 3,000,000 ($8,610,000 at the current rate of exchange). Cattle and sheep are imported mostly from the Sudan, camels and goats from other North African countries.

Other Draft Animals

The donkey (homar) is Egypt's principal beast of burden, indispensable to the fellah and the urban dweller alike. It carries the farmer's produce to the storehouse and the village market and serves as his mount on journeys. In the towns and cities it carries the peddler's packs or draws his cart.

The camel (gamel) is much less used in Egypt as a field animal than might be gathered from the pictures frequently seen of it pulling a plow or turning a waterwheel. A desert animal, it is ill adapted to life on the well-watered land of the Nile valley and delta. As a beast of burden, however, the camel is useful wherever heavy loads have to be carried, and even in towns and cities it is to be seen side by side with modern means of transportation. The present number, nearly 200,000, is about equally divided between the valley and delta. One might expect the desert and desert oases to be the principal breeding place of the camel, but only about 10 per cent of those used in the valley and delta are raised elsewhere.

Horses (hosan) and mules (baghl) are seldom seen outside the urban centers, where they are mainly used for heavy carting and for drawing the carriages that are still a common means of conveyance.

Poultry

Poultry is raised in abundance throughout the country, in city courtyards and on city roofs as well as in the farmstead. The markets are mainly supplied from these family flocks. Only in a few places is poultry raised on a commercial basis, and even there, breeding for stock improvement is practically unknown. Chickens outnumber all other poultry, although pigeons come a close second and the total number of geese, turkeys, and ducks is large. Poultry feed on the farms is largely what the fowls can pick up for themselves, and in the towns and cities, mostly the scraps from the kitchen.

Chickens are generally of poor quality, seldom exceeding three pounds when fully grown. (The exception is the chicken of the Faiyum, noted for its size and quality.) A similar degeneration has taken place in egg production and quality. In the 1920's and 1930's Egypt had a sizable export trade in eggs, but as the result of stock deterioration and poor feeding the eggs have so fallen off in size and protein content that they now find little acceptance in the foreign market. Whatever market still remained at the opening of World War II was lost as the result of an embargo on egg exports during the wartime food shortage and not lifted until 1954. Egg production declined by about 50 per cent between 1941 and 1951.

The Department of Agriculture is trying to develop a better breed of chickens by importing baby chicks from the United States. Replenishing the family flock by purchasing baby chicks is no new experience in Egypt, however. Strangely enough, chicken hatching on a commercial basis is a business of ancient standing, centered in the delta provinces of Minufiya and Sharqiya, in Asyut in the valley, and in the Faiyum. Although as many as 40,000 eggs are hatched in brick incubators heated with cakes of dung and operated without thermometer control, excellent results are obtained.

Other Livestock

Apiculture.

In a country where the greater part of the cultivated land is under practically year-round crop and the average farmer's income from his crops is small, it might be expected that bee keeping would be widely practiced, and in fact it is widespread although generally on a very small scale. Only a few apiaries are operated as commercial enterprises. The average annual yield of honey is only about 1000 tons and it is all locally consumed.

Sericulture.

Silk weaving and embroidery are ancient arts in Egypt, dating probably from late Pharaonic times,[13] but it is not known when mulberry plantings and silk moths were introduced or whether the local growing of silkworms ever developed to a point where it supplied the local silk industry. Within historic times government and individuals have often begun what was hoped might develop into a large-scale sericulture industry, but none of these has met with great success. Although the industry has never completely died out, at present only about 70 tons of cocoons are produced annually.

NOTES

1. The census of 1947 enumerated the total population, including settlements outside the Nile valley and delta and the Suez Canal Zone and the nomad population, as 19,021,840. The United Nations' estimate for 1955 was 23,240,000.

2. From John Ball: Contributions to the Geography of Egypt, Survey and Mines Dept., Ministry of Finance, Cairo, 1939, p. 132.

3. From J. L. Van Ornum: The Regulation of Rivers, New York, 1914, pp. 17-18.

4. Ball, op. cit., pp. 170-173.

5. From A. Lucas: The Chemistry of the River Nile, Paper No. 7, Survey Dept., Ministry of Finance, Cairo, 1906, p. 17.

6. R. Aladjem: The Soils of Egypt, The Near East and India, Vol. 35, No. 926, February, 1929, pp. 213-215.

7. Ball, op. cit., pp. 165-168.

8. See Water Policy and Plan to Expand Cultivation, published in Arabic by The National Economic Planning Board, Cairo, July, 1954.

9. Because of the importance of cotton as the present basis of Egyptian economy, a separate chapter in this volume deals with its cultivation and the history of its development, leading to its unrivaled position in the world market.

10. For these and other comparative figures see Foreign Crops and Markets, U. S. Dept. of Agriculture, Vol. 70, No. 11, pp. 270-271 (for wheat), No. 15, pp. 439-440 (for corn).

11. Andrew Van Hook: Sugar, Its Production, Technology, and Uses, New York, 1949, pp. 129-130.

12. In 1950 (the last year for which detailed statistics are available) 1,568,893 kilograms (3,459,780 pounds), gross weight, of butter and commestible animal and vegetable fats and oils were imported to the value of £E 248,000 (about $924,000) and 4,095,314 kilograms (9,028,530 pounds), gross weight, of cheese to the value of £E 887,145 (about $3,560,000).

13. William F. Leggett: The Story of Silk, New York, 1949, p. 130.

5. IRRIGATION

The Nile is the creator of Egypt and provider of its lifeblood. Through the ages the river has laid down the deep alluvial soil that makes one of the world's most fertile regions, and upon the Nile the Egyptian farmer depends entirely for the watering of the crops that are at present his country's only resource of any significance. Irrigation as now practiced in Egypt represents a continuous effort to use the Nile water to the greatest possible advantage, and the system by which this water is now controlled and conserved during the season of its abundance and fed to the land during the season of its dearth is one of the most remarkable to be found anywhere in the world. Foremost among the economic development projects now planned is the conservation of more Nile water for the irrigation of more land.

TYPES OF IRRIGATION

Irrigation in Egypt is of two types: basin and perennial. For basin irrigation, water is supplied by a single flooding during the high-water period of the Nile and in general affords only one annual cropping season. For perennial irrigation, which makes possible continuous cropping or a yearly succession of two or more crops, the water is supplied mainly by canals throughout the year (except for an annual period, usually of about a month, which is reserved for clearing canals and repairing the various works by which the flow of water is regulated). Some land is watered perennially by lifting water from canals and wells or directly from the Nile by various hand devices, and by steam, diesel, and electric pumps.

Basin Irrigation

From an early date perennial irrigation was carried on in the Nile valley and delta to some extent by lifting water from the river or from wells fed by water percolating from it through the subsoil. However, the earliest form of agriculture on any large scale consisted of the simple sowing of seed in the mud left after the annual flooding of the Nile had subsided and the excess water had drained away. This basin irrigation was a natural development as population increased and better control was needed of the area that could be cropped each year. When basin irrigation somewhat in its present form began is not known, but however crudely operated, it had been a widespread practice for centuries by the time Napoleon invaded the country in 1798 and his engineers compiled the first detailed reports on its agriculture.

For basin irrigation, the land is divided into compartments by earthbanks along the Nile and crossbanks leading outward to the edge of the bordering desert. These compartments are further subdivided into individual holdings and fields. Some of them are still connected directly with the Nile by short canals, but most of the land now under basin irrigation is supplied with water by regular canal systems with masonry regulators at their heads to control the flow and distribution.

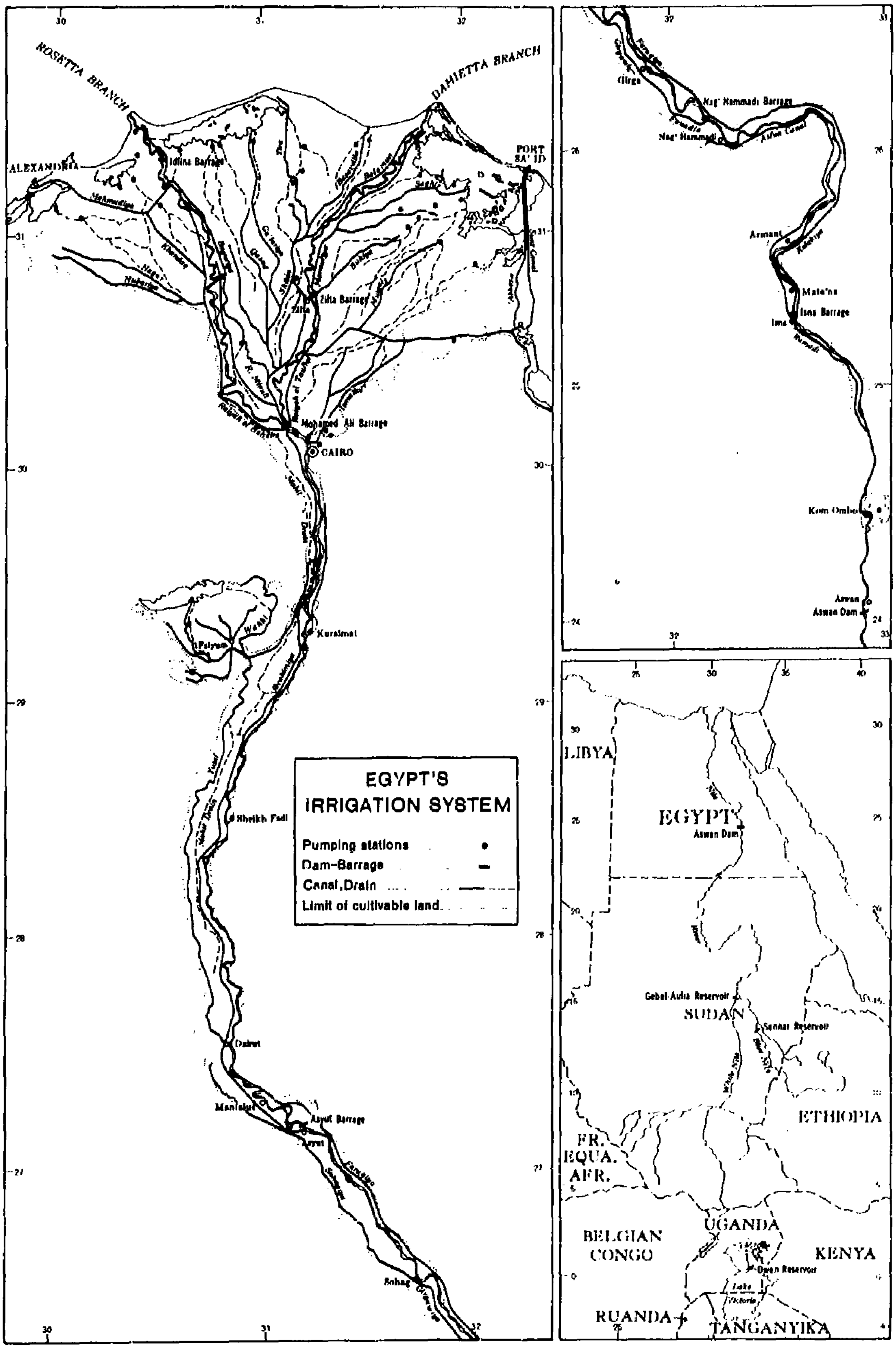
With the annual rise of the river to flood heights, usually beginning about mid-August, the sluices are opened and water is let in to the compartments to a depth of from one to two meters. The water is allowed to stand for from 40 to 60 days, or until the river has subsided sufficiently to permit such water as has not been absorbed by the soil or evaporated to be drained back into it. Meanwhile the standing water has deposited its silt, providing a seedbed ready for planting without further preparation.

Seed (mainly wheat, berseem [Egyptian clover, Trifolium alexandrinum], lentils, barley, chickpeas, fenugreek [an herb with aromatic seeds], and onions) is sown broadcast. The crops are harvested in March and April. Thereafter the land lies fallow until the next rising of the river, since the only water made available to the basins is by this one flooding.

Such is the procedure in basins that are entirely dependent on flooding and devoted exclusively to one-season cropping. But pumping from wells within the basins for summer irrigation (usually for cotton growing) has greatly modified this system. Since the cotton cannot be picked until late August or September, the flooding of the basins in which well irrigation has been introduced must be delayed until the picking is over. Cultivators who depend entirely on flood irrigation claim that as a result of this practice the soil in the parts of these basins that are still irrigated only by flooding is less thoroughly saturated than formerly and the crops are consequently poorer.

Although it generally produces only one crop a year, basin irrigation has certain advantages over perennial irrigation, insofar as its one crop is concerned. No preparation of the seedbed is necessary and generally little use of fertilizers as compared with the needs of land more or less continuously cropped under perennial irrigation. There is some question as to whether the annual deposit of silt (about 1 mm. on the average) makes any significant contribution to the fertility of the soil as is generally contended by the basin farmers, but the annual washing of the soil, the fallow period, and the widespread planting of the quick-growing berseem do much to keep the soil in good condition. Moreover, two of the most serious problems of perennial irrigation - waterlogging and the accumulation of salts from the Nile water - are practically absent. In basin irrigation the deep cracking of the drying fallow permits thorough aeration and penetration by the sun's rays. Consequently, there is little waterlogging, and the salts are brought to the surface to be washed away by the next flooding. [1]

Basin irrigation is now confined to the Nile valley above the delta, where it still covers a total area of nearly 1,000,000 feddans. [2] Most of this area is south of the Asyut Barrage - 692,278 feddans out of a total of 943,905 under cultivation there in 1950; but even north of this barrage 238,753 feddans, or nearly a fourth of the total cultivated area of 978,253 feddans there in 1950, were still under basin irrigation.


EGYPT'S
IRRIGATION SYSTEM
Pumping stations
Dam-Barrage
Canal,Drain
Limit of cultivable land
ROSETTA BRANCH
DAMIETTA BRANCH
ALEXANDRIA
PORT SA'ID
Idfina Barrage
Zifta Barrage
Mohamed Ali Barrage
CAIRO
Kuraimat
Faiyum
Sheikh Fadl
Dairut
Manfalut
Asyut Barrage
Asyut
Sohag
Girga
Nag' Hammadi Barrage
Nag' Hammadi
Armant
Isna Barrage
Isna
Kom Ombo
Aswan
Aswan Dam
LIBYA
EGYPT
SUDAN
ETHIOPIA
Gebel Aulia Reservoir
Sennar Reservoir
FR. EQUA. AFR.
BELGIAN CONGO
UGANDA
KENYA
Owen Reservoir
RUANDA
TANGANYIKA

Perennial Irrigation

In contrast to the simplicity of basin irrigation is the complexity of perennial irrigation. As practiced in Egypt, perennial irrigation involves an elaborate system of storage reservoirs to supplement the natural flow of the Nile during the annual low-water period; of barrages across the river to make it possible during this period to maintain the flow into the canals which take off from it; of main, branch, and distributary canals, with their own barrages and regulators, and drainage ditches. The great annual fluctuation of the Nile makes so elaborate a system necessary, and to operate the system at maximum efficiency requires detailed annual and seasonal crop and water-supply programming and constant vigilance on the part of its official operators.

The advantage of perennial irrigation over basin irrigation is that it not only greatly increases the total potential crop yield per unit area but permits the growing of a much greater variety of crops. For example, crops such as cotton, rice, sugar, and tobacco which require a more or less constant supply of water in certain definite minimum amounts during their growing season can be grown only with perennial irrigation. Hence, if sufficient water can be made available, perennial irrigation will undoubtedly be extended to cover all the land now under basin irrigation in Egypt and will be the type of irrigation provided for all new land added to the present cultivated area. Any such replacement or extension, however, will be attended by much more acute problems of drainage, fertilization, and general soil maintenance than those encountered in the area under basin irrigation.

In the Delta.

Canal-fed perennial irrigation in Egypt began in 1816 when Mohammed Ali, Governor-General from 1805 to 1849, first dug deep canals from the delta branches of the Nile to carry water for the summer irrigation of his cotton plantings. Its present expansion to nearly 5,000,000 feddans - 3,493,320 in Lower Egypt (the Nile delta and contiguous areas) in 1950, and 1,409,772 in Middle and Upper Egypt (the Nile valley and the Faiyum Oasis) - is mainly a development of this century.

Mohammed Ali also began the development of the present system of storage reservoirs and barrages with the construction in 1843 of his great barrage across the heads of the two delta branches of the Nile. Cotton planting and consequently the demand for perennial irrigation received a great impetus very shortly after this barrage was completed in 1861, when the Civil War halted the export of cotton from the United States and obliged the European mills to look elsewhere for supplies.

With the market for Egyptian cotton thus established, it might be expected that the development of the cotton industry would have been made a major policy. On the contrary, when the British began their occupation in 1882, perennial irrigation in the delta had fallen into a serious decline, partly because Mohammed Ali's successors had neither his vision nor his resolution and partly because of the faulty construction of his barrage. In fact not until after 1890, when the British had completed a major work of

reconstruction on this barrage, did it become possible to develop canal systems in the delta with any assurance that a sufficiently high level could be maintained at their heads for them to operate during the annual low-water period of the Nile. Even as late as 1900 only a little more than 700,000 feddans on the delta were under perennial irrigation directly from canals and about 11,000 were watered by pumps. From then on progress was rapid, and today the cultivated land of the delta is wholly under perennial irrigation.

In the Valley.

South of the delta perennial irrigation on any large scale dates from the opening of the Ibrahimiya Canal in 1873. But progress there, too, was slow at first, because for nearly thirty years this canal lacked both a barrage across the Nile to raise the water to its take-off during the low-water period and a regulator to protect it during the flood period. The Asyut Barrage across the Nile immediately below the Canal's take-off, a regulator at its head, and the Aswan Dam, which provides storage of flood water to supplement the natural flow of the river during the low-water period, were all completed in 1902. Thereafter the area of perennial irrigation supplied by the Ibrahimiya Canal was rapidly expanded. By 1940 the canal was supplying nearly 90 per cent of all the land above the delta that is perennially irrigated by canal, and since then the area it supplies has been increased by about 58,000 feddans. The proportion of the total now supplied by the Ibrahimiya Canal has, however, declined to about 75 per cent, because some 335,000 feddans irrigated by canals taking off from the Nile above the Nag 'Hammadi Barrage have been converted from basin to perennial irrigation since 1940.

Lift and Pump Irrigation

Water for the perennial irrigation of small areas, both within basin compartments and elsewhere where canal irrigation is not provided or cannot reach throughout the year, is still lifted from wells, canals, or the Nile itself. For this purpose various hand - and animal-operated devices are used, as well as steam, diesel, and electric pumps. The oldest of the ancient devices is probably the shaduf, which is quite like the well-sweep still seen occasionally in rural areas in the United States. It consists of a pole attached near one end to a crossbeam between two upright posts or the arms of a tree crotch. From the long end of the pole a bucket (or skin) is suspended and to the other a lump of mud or a stone is attached as a counterbalance. The bucket is lowered into the water until it is filled and then lifted with the aid of the counterbalance. If the land to be watered is high above the well or river surface, two or even three shadufs, arranged one above the other, may be used. With a single lift a day's work will water about a quarter of a feddan. 3

Two rather more efficient primitive devices are the Archimedes screw and the saquia, both introduced by the Greeks. The former is used only for short lifts. It consists of a cylinder 3 to 4 meters long with a broad-threaded screw running full length inside and attached by a protruding axis to a crossbar at each end of the cylinder. The cylinder is mounted between two posts and inclined at an angle so that the lower end is in the water. By turning the screw with a crank attached to the upper axis the operator lifts water into a trough

connected with a field ditch. Two men working in shifts can water about three-fourths of a feddan per day with this device.

The saquia is much more elaborate. In its most common form it consists of a vertical water wheel, with pots on its rim, attached by an axis to another vertical wheel with wooden cogs on its rim that mesh with the cogs on a horizontal wheel. The horizontal wheel is turned by a draft animal, who walks round and round it, hitched to the end of a shaft attached at right angles to its axis causing the buckets on the water wheel to dip into the water and empty into a trough as they come up. Where the water is so far below the level of the land that the wheel cannot reach it, an endless rope hung with pots is attached to the wheel.

A considerable acreage in the Nile valley - nearly 190,000 feddans in 1950 - is watered by steam - or electrically-operated pumps, some of them owned and operated by the government and some by large landowners. The pump-irrigated tracts are relatively small and isolated, varying in area from 20,000 to 50,000 feddans, and bordering immediately on the Nile, too high to be reached by canals except during the height of the flood. Pump irrigation is also practiced to some extent in both valley and delta in localities normally watered from canals by gravity flow. In such places, however, it is usually limited to the early days of the flood, when water is everywhere in such demand that all of the canals cannot be supplied with enough to reach every part of the cultivated area by gravity flow. In the delta the use of pumps for this purpose has been much reduced since the new barrages have been in operation. Pumps are also used to some extent in the delta to lift water that seeps into the Nile branches during the period when their barrages are completely closed.

DRAINAGE

Scarcely less extensive than the canals and ditches required for successful perennial irrigation are the accompanying drainage systems. The soil deposited by the Nile through the ages is a clayey silt. Although fairly easily penetrated by water to the depth required for crop growth, it is not sufficiently permeable to permit the rapid filtration of water to its lower beds. The extremely gentle slope of most of the cultivable land adds to the difficulty of evacuating from the soil the surplus of water beyond what is evaporated directly or used by plants, or trans-evaporated from them. Unless adequate artificial drainage is provided, the soil becomes waterlogged, and fertility-destructive salt incrustations accumulate on the surface and in rainless Egypt stand no chance of being washed away except where basin irrigation is practiced.

Providing adequate drainage has been much less difficult in the Nile valley than in the delta. When the conversion from basin to perennial irrigation began there, the need for good drainage was well recognized, and the laying of drains was as carefully studied and as systematically carried out as was the digging of the irrigation canals. For example, the government-owned drainage system for the valley land watered by the Ibrahimiya Canal includes a main drain, called the Mohit, which runs for

some 350 km. (224 mi.) from near Dairut to the Rosetta Branch of the Nile. A system of short drains, also government owned, leads into the Mohit at 500-meter intervals, and a succession of outlets drains into the Nile and the Bahr Yusef. Even there, however, drainage pumps have to be used during the height of the Nile flood. Drainage in the Faiyum is mostly by gravity flow into its large lake, the Birket Qarun, although a strip bordering on the lake is of such gentle slope that pumps are required to accelerate the flow in its drainage ditches, and a low section in the southwestern part of the depression also has to be pump drained.

In the delta the problem of drainage is difficult enough because the land stands so little above the sea and because the natural accumulation of salts is greater than in the valley. The difficulty is increased by the fact that much of the delta's canal system was in operation before the role of drainage in the maintenance of perennially irrigated land was fully understood. Because of the salt content in the soil, the drains have to be deeper and closer together than in the valley in order to inhibit as far as possible the rising of the salts to the surface by capillary action. Furthermore, a regular alternation of canals and drains such as could be effected in the valley was impossible in the delta, because the drainage system there had to be largely introduced into the canal system, rather than laid out simultaneously with it. Consequently, much drainage water has to be lifted by pumps into a system of main drains; this is particularly the case with land less than 3.5 meters (12 feet) above sea level. For some small areas short separate drains are provided, from which the water is pumped directly into the sea or a coastal lake. Drainage for an area of about 250,000 feddans bordering on Lake Maryut is provided by keeping the surface of the lake pumped down to 3 meters above sea level. The majority of these pumps are electrically driven. [4] In addition to the expense of keeping the drains cleared, a principal objection to open-ditch drainage is that it occupies too much of the land - in some sections of the delta as much as a tenth of the area - in a country like Egypt where arable land is at a premium. Some of the collecting ditches are being replaced by small-bore tiles of porous cement, but the initial capital outlay is so great that there is little prospect of any broad development of tile drainage, except perhaps on some of the larger estates.

EXISTING IRRIGATION WORKS

The works which control the water for Egypt's present irrigation system consist of three dams, six major barrages (three on the main river and three on its delta branches), and numerous smaller canal barrages and regulators. (In this system a "dam" is a structure that forms a reservoir for the storage of water during the annual flood period of the Nile in order to supplement the natural flow of the river during the low-water period; a "barrage" merely raises the river or canal level, when necessary, to the height required for adequate flow into the canals that take off above it.)

The Delta Barrages

The Mohammed Ali Barrage.

The first of these works was a barrage built about nineteen kilometers (twelve miles.) ' north of Cairo across the two main branches into which the Nile divides to flow through its delta. Construction was begun in 1843 by Mohammed Ali and was completed in 1861, twelve years after his death.

Napoleon, during his occupation of Egypt from 1798 to 1801, had suggested the need of a barrage at the head of the delta. The purpose of such a work, as he envisaged it, would be to direct the entire flow of the Nile alternately into one branch or the other and thus, as he said, "doublier l'inondation." [5] But in 1816, when Mohammed Ali undertook to increase the supply of water for the summer irrigation of his new cotton plantings in the delta, he began by improving the banks of the delta branches and digging deep canals from them.

Disappointed by the smallness of the areas to which his canals could carry water during the low-water period, and impatient with the amount of labor required annually to keep the canals deep enough to carry any water at all, Mohammed Ali in 1833 began the construction of a solid stone dam across the Rosetta Branch. It was designed to divert the entire discharge of the Nile into the Damietta Branch, from which the more important of his canals had been led. Before this project was far advanced, however, his Minister of Public Works (the Belgian engineer, Linant de Bellefonds, best known for his subsequent work with De Lesseps on the Suez Canal) persuaded him to undertake instead the construction of barrages with sluice gates on both of the branches.

The laying of foundations was actually begun, but Mohammed Ali, impatient for immediate results, soon abandoned the idea, stopped the work, and returned to the annual clearing of his canals. Nothing was heard of the barrage again until 1842, when a new plan proposed by a French engineer, Mougel (also later identified with the Suez Canal), was accepted, and the work was resumed the following year.

The barrage as finally completed was an imposing structure. Of its two sections, that across the Rosetta Branch was 465 meters (1525 feet) long with 61 sluice vents and that across the Damietta Branch 535 meters (1754.8 feet) long with 71 vents. Sluice vents were five meters wide. At the ends of both barrages locks for navigation were installed, twelve meters wide at one end and fifteen at the other. The sluice vents were closed by iron gates ingeniously constructed of cylinders turning on a horizontal axis. The two barrages were joined by an elevated causeway 8.6 meters wide between its walls, with drawbridges at the locks. Elaborate fortifications with towers and turrets completed the structure. [6]

The barrage was badly built, owing principally to the speed with which Mohammed Ali insisted that the work proceed. Not only was it unable to withstand even half the head of water of 3.5 meters it was designed to hold, but constant repair was necessary to keep it operating at all. Not until 1890,

when the British finally completed reconstruction, did the barrage really begin to serve its intended purpose and could any large-scale conversion of delta land from basin to perennial irrigation be accomplished.

Even then, repair crews had to be in constant attendance, owing mainly to the weakness of the foundations, about which little could be done in the reconstruction operation. The head that it was hoped the reconstruction would allow could never be reached. Low weirs of solid masonry, each with a lock for navigation purposes, were later built across both branches some distance below the barrage to maintain a water level against the downstream side of the barrage to aid it in resisting the water pressure from the upstream side.

Thus reinforced, the reconstructed barrage did good service for many years, during which the greater part of the present perennial irrigation of the delta was developed. It was finally decided, however, that a completely new barrage was needed if the delta was to be assured the full benefit of whatever Nile water might eventually be brought to its head. This new barrage - the Mohammed Ali Barrage - was completed in 1939, 7 km. (4.3 mi.) below the old barrage, which was then abandoned, although it has been retained as a monument and is still used as a road bridge.

The Mohammed Ali Barrage has 41 sluice vents, each 8 meters (about 26.5 feet) wide, on the Rosetta Branch and 34 on the Damietta Branch, and a lock for navigation on each branch. The barrage is designed to maintain a water depth of 3.5 meters. Hydroelectrical generators installed in it provide power for local use. The barrage controls three main canals which feed the irrigation systems of the delta (known as the Beheira, Minufiya, and Taufiqi) and the Ismailiya Canal. The last, which was originally opened in 1873, takes off from the main Nile a short distance north of Cairo and was built to carry fresh water to Ismailiya, Port Sa'id, and Suez, but it also supplies an irrigation system of its own. (For further details on the Ismailiya Canal, see Chapter 11, The Suez Canal, and the section on the Nile delta in Chapter 2, Landscapes and Regions.)

Other Delta Barrages.

An additional barrage has been built both on the Damietta and on the Rosetta branches. The Zifta Barrage, in operation since 1903 on the Damietta Branch, 85 km. (54.7 mi.) below the bifurcation, has 50 sluice vents each 5 meters wide, and a 12-meter navigation lock. It also has an auxiliary weir 200 meters below it, like those constructed to relieve the old delta barrage. The Zifta Barrage was installed primarily to serve as an auxiliary to the delta barrage during the early part of the rise of the Nile flood, when the demand for water is particularly heavy not only in the delta but throughout the valley. At this time it is frequently difficult to supply the northernmost portion that is watered by the Damietta Branch through the canals that take off above the Mohammed Ali Barrage. To remedy this, two main canals were so constructed as to take off immediately above the Zifta Barrage.

Egypt's most recent irrigation work is the Idfina Barrage, completed in 1951 on the Rosetta Branch a short distance above the town of Rosetta. In appearance, this barrage is much like the other delta barrages, with its sluice gates and navigation lock, but it has a double function. Like the Zifta Barrage, it serves as an auxiliary to the Mohammed Ali Barrage. It also takes the place of the earth dam, or sudd, formerly built above the mouth of the Rosetta Branch each year to keep sea water from entering during the low-water period when the Mohammed Ali Barrage is closed and all Nile water is sent into the canals. (Sudd, as these earth dams are commonly called, is the Arabic word for a blockage.) A similar barrage is planned on the Damietta Branch to replace the annual sudd construction there. When plans for the Idfina Barrage were being drafted, it was estimated that it would also make possible the retention in an enlarged Aswan Reservoir of about a billion cubic meters (810,000 acre-feet) of water - water that now has to be sent down the Rosetta Branch between the end of October and late December to keep back the salt water.[7]

Works on the Main Nile

The Ibrahimiya Canal.

No works were put into operation on the main Nile above the delta until 1902, when both the Asyut Barrage and the Aswan Dam were completed. The Ibrahimiya Canal, which takes off from the west side of the Nile immediately above the Asyut Barrage and is now the longest and largest canal in Egypt's entire irrigation system, was opened in 1873. As has been mentioned, it operated for 30 years with no works to control the water level in the Nile at its take-off and not even a regulator at its head to protect it in time of flood. The Viceroy Ismail, son of Mohammed Ali's son Ibrahim, constructed it and named it for his father. The purpose was to supply water for the summer irrigation of the plantings of sugar cane that Ismail was introducing on the great estates he had seized for his own use in the provinces of Asyut, Minya, and Beni Suef, and in the Faiyum Oasis.

As originally constructed the Ibrahimiya Canal was 268 km. (166 mi.) long, with a regulator opposite Dairut, 62 km. (39 mi.) from its head. It also supplies the water for the Bahr Yusef, which carries Nile water to the Faiyum Oasis. This is an old watercourse that winds for 276 km. (171 mi.) along the edge of the desert slope that borders the Nile valley and then breaks through into the oasis. Before the Ibrahimiya Canal was dug it took off directly from the Nile at Dairut. When the canal was put through this connection was closed and a new connection made with the canal immediately above its Dairut regulator. The canal when first opened was 35 meters wide, but with no regulator at its head, it was completely at the mercy of the floods, and the section above the Dairut regulator was soon scoured out to twice its original width. Consequently, the clearing of the silt above the Dairut regulator meant a heavy annual expense.

Although the canal was constructed to supply water for perennial irrigation in the Nile valley, the maximum area for which it afforded this type of irrigation there during its first thirty years was only about 340,000 feddans. It also, however, supplied water to the Bahr Yusef for some 530,000 feddans

of basin irrigation along its banks and up to 346,000 feddans under perennial irrigation in the Faiyum Oasis.[8]

The area under perennial irrigation supplied by the Ibrahimiya Canal was rapidly expanded after the completion of the Aswan Dam and the Asyut Barrage in 1902 and the installation of a regulator at its head in the same year. The canal is now 314 km. (195 mi.) long from its take-off on the Nile to Aiyat, where it connects with the Giza Canal, which carries its surplus water for another 80 km. (50 mi.) to empty into the Beheira Canal of the delta system. The 130-kilometer (81-mile) Giza Canal takes off from the Bahr Yusef at the Lahun regulator, which controls the flow of water into the Faiyum Oasis, and is the principal source of supply for irrigation in Giza province.

In 1950 the Ibrahimiya Canal was supplying the water for 739,500 feddans under perennial irrigation in the Nile valley and 418,645 in the Faiyum. Only about 140,000 feddans along the west side of the Bahr Yusef and certain small areas in the provinces of Beni Suef and Giza, supplied by the Giza Canal, remain under basin irrigation.

The Asyut Barrage.

The Asyut Barrage, 423 km. (262 mi.) above the head of the delta, is built in the form of a masonry bridge 823 meters (2699 feet) long, erected on a base 26.5 meters wide by 3 meters thick, with 111 sluice vents each 5 meters wide, and a navigation lock at its extreme west end 16 meters wide and 18 long. The hydraulically-operated sluice gates are in two sections, each 2.5 meters high, placed one above the other so as to form a gate 5 meters high when completely closed. The barrage is designed to hold the river level at 2.5 meters above its mean lowest level in the low-water period. The roadbed on the top of the barrage is 12.5 meters above the foundation.

The Aswan Dam and Reservoir.

The Aswan Dam at the First or Aswan Cataract, is 965 km. (599 mi.) above the Mohammed Ali Barrage. It impounds a reservoir of the same name, the only reservoir on the Nile in Egyptian territory. The location is ideal. The cataract, between the town of Aswan and the Island of the Philae, is five kilometers long, an island-strewn succession of rapids over a sill of syenite and diorite, with a fall of about five meters. It marks the southern limit of tracts of cultivable land that are of any substantial area. Before the dam was built, there were settlements of Nubians in the part of the valley now flooded by the reservoir, but compensation was paid the owners for their land, and most of the families simply moved up above the level of the reservoir and now carry on some agriculture by pumping up water.

This dam has been heightened twice since it was first put into operation in 1902 - in 1912 and again in 1934. The plans as originally drafted provided for a dam of nearly its present height. The Aswan area, however, is the site of numerous ancient temples - most notably the Philae, on an island of that name immediately above the dam location - and the prospect that many of these would be flooded by so deep a reservoir brought strong protest. The dam was consequently first built so low that the amount of water that could be stored was of relatively little value in proportion to the need it was intended to satisfy.

However, the demand for water soon triumphed over sentiment and archeological interest. Many of the temples are now flooded when the twice-heightened reservoir is filled, and the Philae temples are almost completely submerged. Repaired and reinforced to withstand the rising water, they appear to have in no way suffered from their annual inundations.

As first constructed, the dam was designed to support a head of 20 meters, impounding at that height a reservoir of about one billion cubic meters (834,130 acre feet). It was 1966 meters (6448 feet) long with a solid wall 500 meters long at the east end and a navigation lock at the west. Between these were 180 sluices with gates, arranged at different levels to make it possible to distribute the force of the discharge when the impounded water was being released. For navigation through the rapids and up to the highest level of the reservoir a canal was cut along the west side of the river 20 meters wide and 2 kilometers long with 3 locks, in addition to one in the dam, each 9.5 meters wide and 75 meters long.

Within a year it was found that the discharge from the reservoir was creating such disturbance in the rapids below the dam as to threaten to undermine the dam's foundation. Hence between 1904 and 1906 a wide apron of heavy masonry was built against the downstream edge of the foundation. When this was completed, work was begun to raise the dam to a height that would provide an allowable head of 27 meters and form a reservoir of 2.3 billion cubic-meter (1,864,610 acre feet) capacity, or more than twice that of the original reservoir. The widening and strengthening of the original dam for this first heightening was a major engineering operation as to both design and execution. The work, which included the heightening of the walls and gates of the existing ship canal locks by six meters and the construction of an additional lock, was completed in 1912.[9]

The heightened dam had scarcely been put into operation when the need for even greater water storage than it provided was brought sharply into focus by the phenomenally low Nile flood of 1913, the lowest on record. Study was at once begun of the possibilities for a further heightening of the dam. A plan was finally drafted, submitted to an international commission of engineers, and approved by them with some minor modifications. This second heightening of the dam, completed in 1934, was a much less difficult task than the first; it involved constructing buttresses against the back of the dam and then erecting the new structure directly on top of the old. The dam now stands 38 meters (124.6 feet) above the level of its foundation and impounds a reservoir which extends to the Second Cataract, a distance of 345 km. (214 mi.), and when full holds 5.3 billion cubic meters (4.29 million acre feet) of water,[10] or a little less than half as much as does the Grand Coulee Reservoir.

The construction of the Aswan Dam and the Asyut Barrage introduced a new era in Egyptian agriculture. Together they made possible not only a greatly expanded area of perennial irrigation in the Nile valley but the programming of the water supply for both valley and delta throughout the year. To the delta the Aswan Reservoir also assures an adequate water supply through a much longer season than ever before.

The Isna and Nag 'Hammadi Barrages.

Two additional barrages were subsequently built on the main Nile between the Aswan Dam and the Asyut Barrage. These are the Isna Barrage, 385 km. (239 mi.) south of Asyut, completed in 1908; and the Nag 'Hammadi Barrage, 177 km. (110 mi.) north of the Isna Barrage, completed in 1930.

The Isna Barrage was constructed to permit the raising of the river level to the height required to assure the flow of water into two main canals that take off above it. Both of these canals were already in operation when the construction of the barrage was begun, supplying the major part of the water for areas under basin irrigation: the Asfur Canal for about 112,000 feddans along the west side of the Nile and the Kelabiya Canal for about 80,000 feddans on the east side.[11] By 1940 the Isna canals were supplying a total area of 255,800 feddans under basin irrigation and 21,500 feddans for which water for perennial irrigation was lifted by pumps. The barrage rests on a foundation 30 meters wide by 3 thick; it has 120 sluices, each with two sluice gates 5 meters wide and 3 meters high placed one above the other, and there is a navigation lock at its west end. The barrage was originally constructed to support a maximum head of 2.5 meters,[12] but during the late 1940's it was heightened with a view to raising the water above it high enough eventually to supply its canals with water for the perennial irrigation of about a quarter of a million feddans that were then still under basin irrigation. Thus further conversion to perennial irrigation is now in progress.

Two main canals take off from the Nile above the Nag 'Hammadi Barrage. The Faruqiya Canal on the east side of the river, whose construction involved tunneling through a rocky spur immediately below its take-off, originally supplied basin-irrigation water to some 115,000 feddans. By 1940, 60,000 feddans of this area had been converted to perennial irrigation, and another 37,500 feddans immediately north of the barrage had been added. Considerable further conversion has since been carried out. Water carried by the Fouadiya Canal on the west side of the river, supplemented by flood-water canals taking off directly from the Nile at Sohag and Asyut, originally supplied a strip of approximately 315,000 feddans under basin irrigation and extending for about 45 miles north of Asyut. By 1940 conversion to perennial irrigation had reduced this to 202,000 feddans under basin irrigation. Meanwhile, additions to the converted area had brought the total under perennial irrigation supplied by the Fouadiya and Sohagiya canals to 263,000 feddans, plus 10,000 in which some basin irrigation was still carried on.[13]

The Sudan Reservoirs

Two other reservoirs, both in the Sudan Republic, complete the storage installations that now serve Egypt's irrigation system. These are the Gebel Aulia Reservoir on the White Nile and the Sennar on the Blue Nile. The Gebel Aulia Reservoir was created exclusively to serve Egypt. Built by the Egyptian government, its dam was completed in 1937, and lies 47 km. (29 mi.) south of the junction of the White Nile and the Blue Nile at Khartoum, 1922 km. (1119 mi.) south of the Aswan Dam, and 1577 km. (1979 mi.) south of the Egyptian border. Funds for the construction of the Sennar Dam, completed

in 1925, 359 km. (230 mi.) south of Khartoum and 2234 km. (1387 mi.) from the Aswan Dam, were supplied jointly by the Anglo-Egyptian Sudan government and the Sudan Plantations Syndicate, a private enterprise.

The Sennar Dam and Reservoir.

The Sennar Dam is 3025 meters (9922 feet) long, with ends of earth-banked masonry walls and a center span of masonry 1607 meters long, with 80 steel-gated sluice vents each 2 meters wide and 8.4 high. Unlike other Nile dams and barrages, the Sennar has spillways above both the sluices and the solid masonry ends that can be closed by barring them with heavy timbers. The original purpose of the Sennar Dam was to maintain a sufficient head of water to supply the main canal of what is known as the Gezira Irrigation Scheme; this "scheme" now covers a tract of about 1,000,000 feddans in the Sudan, on which long-staple cotton is the most important crop. For this purpose the dam functions solely as a barrage during part of the irrigation season in the Gezira tract. However, it was built high enough to function also as a reservoir that provides storage water for the Gezira tract during the periods when, under the terms of the Egyptian-Sudanese Water Agreement of 1929, the full natural flow of the Blue Nile must be passed on to Egypt. When the reservoir is filled to its present capacity of 780 million cubic meters (633 thousand acre feet), it reaches upstream for 150 km. (93 mi.).[14]

The Gebel Aulia Dam and Reservoir.

Before the Gebel Aulia Dam was built, the heavy discharge from the Blue Nile when in flood impounded the water of the shallow, gently sloping White Nile and held it as in a reservoir until the Blue Nile had subsided. The Blue Nile flood thus produced a pond 3 to 4 km. wide and extending upstream more than 200 km. (124 mi.), but there was no control of the release of this pond once the blue Nile flood had passed. This suggested the construction of the Gebel Aulia Dam.

The Gebel Aulia Dam is 5 km. (3.1 mi.) long. It has a 1693-kilometer (about one-mile) masonry center, with 50 roller sluices each 3 meters wide and 4.5 high, earth embankment ends with core walls, and also a navigation lock. With a maximum head of about 7.5 meters (24.6 feet), the dam creates a reservoir which, when full, is 314 km. (nearly 195 mi.) long and holds a little over 3.6 billion cubic meters (nearly 3 million acre feet) of water, or about 68 per cent of the Aswan Reservoir's capacity.[15]

THE IRRIGATION SERVICE: ORGANIZATION AND ADMINISTRATION

The vigilance necessary to keep Egypt's elaborate and highly complicated irrigation system working at its present high degree of efficiency are scarcely less remarkable than is the system itself. Egypt has today a total of nearly 6,000,000 acres under cultivation. Three-eighths of it lie in a narrow, 1200-kilometer (745-mile) ribbon in the Nile valley and the remainder is in the delta, where drainage is almost as serious a problem as is irrigation. Practically the whole support of the Egyptian people is derived from the agricultural production of these 6,000,000 acres, and it

can be assured them only by comprehensive planning and water budgeting and by constant supervision against disaster both from shortage of water and from flood.

It has been said that modern Egypt is the creation of the hydraulic engineer, and the country certainly depends largely upon the hydraulic engineer for the maintenance and further development of its agricultural production. The planning and construction of Egypt's present irrigation system and the technique of its operation must be credited mainly to the British, as must much of the exploration and field investigation of the sources of water supply. A number of British engineers and administrators were retained during the early years of Egypt's independence; a British engineer was director of the Physical Department of the Ministry of Public Works until 1946. Nor has there been lessening of the vigilance with which the irrigation system has been kept up and operated since Egyptians replaced these British engineers. The engineering staff is recruited mostly from graduates of Egypt's own School of Engineering at Cairo and others who have completed their training abroad.

All dams, barrages, regulators, and main canals, as well as branch and distributary canals, are under government ownership and maintenance. Only the actual irrigation ditches - the misqa, as they are called in Arabic - and the field ditches and furrows are maintained by the cultivator, and even the misqas may be taken over by the Irrigation Service and operated as public property, if they supply the water for more than a thousand feddans and the owners so request. Also, in case the owners delay in clearing the misqas, the government may clear them and charge the cost to the cultivators whose land they supply.

Before the British occupation, the work of keeping canals and embankments and drainage lines in condition and of constructing new ones was done by corvée, an ancient system of forced and unremunerated labor. At present, forced labor is resorted to only when the river in flood breaks through an embankment or a breakthrough is imminent. Then the cultivators are ordered out for watch duty and repair work, but they are paid at a regular, established rate.

The land for which irrigation water is provided is divided into 10 inspectorates, or circles as they are called, four in the delta and six in the valley. Each has an inspector with his headquarters in a town in his circle. The circles are divided into districts, covering usually about 40,000 feddans, with a district engineer in charge. Under each district engineer there is a corps of canal patrolmen and watchmen who do the actual work of operating the regulators, bridges, etc., and generally keeping the irrigation system of the district working and in working order. There are also resident engineers, who are responsible to the inspectors of their respective circles at the Aswan, Gebel Aulia, and Sennar reservoirs and at each of the river barrages.

The needs, complaints, and recommendations of the cultivators are brought to the attention of Irrigation Service officials through the Provincial Councils, to which two members are elected from each administrative

(not to be confused with the irrigation) district, and the mudirs, or provincial governors, who preside at the council meetings. Through the mudirs and the Provincial Councils, moreover, details of water budgeting and supply and other information and instructions are conveyed to the district and village authorities and thence to the cultivators.

Inspectors are responsible to Inspectors-General - one for the delta and one for the valley - and these are responsible to an Under-Secretary in the Ministry of Public Works, who is the Head of the Irrigation Service. The Inspectors-General and their staffs meet with the Under-Secretary to decide on the seasonal water budgets and programs of control at the various river barrages. Their decisions are based on the acreage under various crops, the average daily amount of water per feddan allotted for each crop, and the amount of water that will be available at any given time, as indicated by readings of the numerous gauges maintained on the rivers that feed the main Nile and at the storage reservoirs.

Assistance from Other Services

In the Physical Department of the Ministry of Public Works there are two other services whose work is basic to the water-supply program of the Irrigation Service. The Meteorological Service maintains a large number of stations in Egypt and in the Sudan Republic and issues daily weather reports and weather forecasts based on observations received telegraphically from selected stations. The Hydrological Service receives and checks the river-gauge readings supplied by the Irrigation Service, publishes a selection of them in the Daily Weather Report, and issues a monthly summary of conditions on the main Nile and of the discharges of its tributaries. It also maintains rain-gauge stations at critical points in the Sudan and Ethiopia and receives rainfall observations from stations in Tanganyika and Kenya.[16]

Tax Support

Direct support for the Irrigation Service is derived from the Land Tax and supplemented by revenue from the government-owned railroads, customs collections, etc. There is no direct water tax. When the owner of basin-irrigated land makes his annual land tax payment, the government is obligated to supply him with sufficient water for the maturing of one crop on the whole of his irrigated land. If, owing to shortage of water during the flood season, or for any other reason, the basin farmer is not supplied with enough water, his tax is remitted in proportion to the percentage of land that he cannot crop.

This tax remission is not applicable to land under perennial irrigation, on which, theoretically at least, irrigation water is assured throughout the year. This is because it is assumed that a shortage of water for land under perennial irrigation is possible only during the low-water period of the Nile flow. The "perennial" farmer is thus assured of one crop a year, as is the "basin" farmer, and if there is insufficient water for more crops during the low-water period the government's sole obligation is to distribute as equitably as possible such water as is available.

In addition to the regular land tax, based on land values as established by periodic reassessments, super-taxes may be applied from time to time to remunerate the government for the construction cost of dams, barrages, and other major irrigation works.

THE IRRIGATION YEAR

The irrigation year in Egypt is divided into two periods: one generally from late July to the end of December, when the natural flow of the river exceeds all present irrigation needs; and the other from February through most of July, when it is necessary to supplement the natural flow with stored water and to bring the various river barrages and canal regulators into operation. (During January all canals are closed for clearing of silt and repairing barrages and regulators.)

The Flood Period

The irrigation year opens when the river begins its annual rise at the Aswan Dam, usually in mid-May. At the head of the delta the rise commences about a month later. The program for water budgeting and the allotment of acreage for summer crops can now be drawn up on the basis of gauge readings on the Nile tributaries. At this time of year the natural flow in the main Nile is supplied chiefly by the White Nile.

In normal years, the annual flood of the main Nile rises by the end of July to a point where the natural flow of the river is sufficient to supply all irrigation needs and storage supplement is no longer required. The Aswan Reservoir is now empty, its dam is open, and the river is allowed to flow freely through all its barrages. By mid-August the Idfina Barrage, near the mouth of the Rosetta Branch, and the Faraskour Sudd, at a corresponding position on the Damietta Branch, both usually closed in early February, have been opened to permit the free flow of all the river's surplus to the sea.

By the first week in August the flooding of the areas under basin irrigation nearest the Aswan Dam is begun. The process is continued progressively downstream until, by the first week in September, flood water is standing in all the basins throughout the Nile valley, except for certain areas watered from wells for cotton growing where the flooding is delayed until after the crop is picked.

The flood which lasts through November, is at its height during September, when the average discharge at Aswan is around 8500 cubic meters (about 7 acre feet) as compared with an average low of 600 cubic meters (about half an acre foot) per second in May. (The lowest discharge ever measured was 300 cubic meters, and the highest is estimated at 13,000.) The flood comes mainly from the Blue Nile and the Atbara. In March or April rain begins to fall in the Ethiopian highlands, where these two rivers have their principal sources; by June both are well on the rise, and rapidly reach their heights, the Blue Nile usually early in September and the Atbara a little earlier. An exceptionally high flood on the main Nile results from excessive rainfall at the sources of the two tributaries within a relatively short period,

and one cause of dangerous floods is the simultaneous occurrence of the peaks of floods in the two rivers. Both rivers fall rapidly; by the following April the Blue Nile may be down to not more than a fortieth of its flood discharge, and the Atbara is actually dry in normal years except during a few months.

In September and October the Nile for much of its length in Egypt is generally above the level of the bordering land, which heavy embankments protect from flooding. At bends in the river where there is danger that these embankments may be eroded away, stone wing dams have been built to deflect the current, and in many places the bank itself is reinforced with facings of stone or reeds. Flood time is a period of great vigilance on the part of the irrigation engineers and watchmen and the local authorities.

Filling of the Reservoirs

Gebel Aulia.

The first of the reservoirs to be filled is the Gebel Aulia on the White Nile. Since the White Nile carries little silt, this reservoir can be filled while the river is in flood. Filling consequently begins as soon as the Blue Nile and Atbara floods have reached a sufficient volume to supply Egypt, as indicated by gauge readings on the main river below the Atbara mouth. This is usually early in July, but may be somewhat later. When the filling begins, the sluice gates are closed tight and no White Nile water flows into the main Nile until the reservoir is full - about the end of September or early in October. From then on the reservoir is kept full until its water is needed at the Aswan Reservoir, with only the surplus allowed to flow into the main Nile. (Since the surface area of the full reservoir is so large, there is considerable evaporation of water and its continuous replacement subtracts an appreciable amount from what would otherwise be the White Nile discharge during this period.)

Sennar.

Meanwhile the control of the Blue Nile is also under way - a complicated operation based on continuous flow measurements on both the Blue Nile and the main Nile. Up to the middle of July the flow through the Sennar Dam is unrestricted, but mid-July sees the beginning of the irrigation of the summer cotton crop of the Gezira tract in the Sudan Republic, for which the dam was primarily constructed. Then the dam is partially closed to raise the river upstream to the level necessary for free flow into the Gezira Canal of its daily water quota as established under the Water Agreement of 1929. This level involves bringing the water in the reservoir up to about a third of its capacity and is held until November, when the filling of the reservoir is completed. Not until some time in January, however, does the natural flow of the river cease to be sufficient to serve the needs of both Gezira tract and Egypt, and only then is the reservoir water drawn upon. Thereafter, the whole of the natural flow of the river passes on to Egypt, and the Gezira tract is supplied entirely by stored water until the close of its irrigation year; the quantity stored, an average of about 780 million cubic meters (635,000 acre feet), is the amount that experience has shown to be needed for this period.

Aswan.

In spite of the heavy surplus that flows through the Aswan Dam during the first three months of the flood period, storage in its reservoir cannot be started, unfortunately, until the flood is past its peak. The flood waters of the Blue Nile and Atbara are heavy with silt, and filling of the reservoir must be delayed until the flood has subsided enough for its reduced deposit of silt to be readily washed out in the next flood. This is usually sometime in October. From then on until the reservoir is filled - normally by the end of January - all the water arriving at the Aswan Dam, beyond what is needed below it for irrigation and navigation, is stored, and until the reservoir is once again emptied (usually about the end of July) the Nile water in Egypt is entirely under control.

Flood Subsidence and Low Water

For some weeks after the perennial-irrigation canals are again opened, following the January intermission for clearing and repairing, the natural flow of the Nile, supplied by the Blue Nile and the Atbara and to some extent by overflow from the Gebel Aulia Reservoir, is normally sufficient for whatever irrigation is required. But before the end of February it has so declined that it must be supplemented by storage water.

The Gebel Aulia Reservoir is drawn on first. Owing to the broad expanse of this shallow reservoir and consequent exposure of its stored water to greater evaporation than from the Aswan Reservoir, it is good economy to empty it before the Aswan storage is begun to be drawn from. By early May, Gebel Aulia is usually empty, and from then on until toward the end of July when the rising river again meets the crop requirements, Egypt must depend solely upon the Aswan Reservoir to supplement the low natural flow of the Nile. The normal storage of the two reservoirs, about 3.6 billion cubic meters (nearly 3 million acre feet) in the Gebel Aulia and 5.3 billion (about 4.3 acre feet) in the Aswan, increases the low-stage discharge of the natural river in Egypt by about 50 per cent in normal years.

Low-water Control

Control operations in the delta during the low-water period involve three main procedures: (1) closing the sluices in the barrages across the heads of the two Nile branches so that, for a period extending usually from early February to late July, the only water coming into the delta is supplied by the canals heading above these barrages; (2) maintaining the river level above the barrages at a height that assures sufficient flow into these canals; and (3) blocking the mouths of the river branches against invasion by sea water by closing the Idfina Barrage on the Rosetta Branch and building the sudd at Faraskour on the Damietta Branch. The minimum daily quota of water arriving at the barrages at the head of the delta is the amount allotted by the Irrigation Service in its annual water-budgeting program plus such increases as may subsequently be found possible, or minus any decreases necessitated by unforeseen emergencies.

In the delta and the valley the equitable distribution of the water available during the low-water period depends upon the precision with which the program is executed for the daily release of water from the Aswan Reservoir and its allotment to the main canals commanded by the river barrages. Within the irrigation systems supplied by these canals, equitable distribution calls for constant attention not only to the operation of the publicly-owned canal barrages and regulators, but also to the ditches by which the cultivator takes the water allotted to him from the distributary canals.

The whole operation and the responsibilities and duties of all who participate in it, from the head of the Irrigation Service to the ultimate beneficiary on his plot of ground, are defined by the Egyptian Canal Act of February 22, 1894, and by numerous subsequent amendatory and supplementary legislative acts and decrees.[17]

Even in years when the water supply is adequate for all parts of the area under cultivation, the system does not always work with complete efficiency, despite the minute attention to detail with which operatory regulations have been developed and the care with which the water-allotment programs are worked out. By and large, however, in years of normal water supply, failure of the system to function as planned results from the failure of village authorities to enforce regulations that do not conform with the wishes of a particular cultivator or group of cultivators. Such failures, consequently, are usually restricted to relatively small areas.

Normal and Abnormal Years

The above description of an irrigation year applies in full only to years in which the water supply is at least adequate for the land now cultivated and in which advance calculations as to both quantity and timing turn out to be satisfactorily accurate. The Nile's water, however, comes from so many sources, distributed over so wide a range of latitude, altitude, and possible climatic variations, that advance calculations cannot always attain the hoped-for accuracy. Moreover, even during the relatively brief period in which observations of the amounts and times of the river's discharge have been recorded, there have been many years when the total discharge, from the standpoint of irrigation requirements, has varied from somewhat less than good to very poor, as shown in the following table adapted from one in a report by a former Inspector-General of Egyptian Irrigation in the Sudan.[18] (In this table the figures represent the discharge at Aswan for a number of significant years, plus allowances for the water stored in the Sennar and Aswan reservoirs; thus the table shows what would have been the "natural flow" of the river.)

Table 1 - Annual Discharge of the Nile at Aswan, 1912-1932 (August to July)

		Million cubic meters	Million acre feet
Average	1912-32	82,000	66.5
Lowest year	1913-14	42,000	34.5
Very low or standard year	1925-26	70,000	36.7
Good year	1914-15	90,000	72.9
Maximum year	1879-80	155,000	125.6

Since the average amount of water used annually for irrigation in Egypt at present is about 46,000 million cubic meters (37.3 million acre feet) it might be assumed that except in the lowest year recorded there was sufficient water. In both good years and bad, however, about half the total discharge occurs when the water is so siltladen that it cannot be stored in the present Aswan Reservoir, and any surplus beyond that used for irrigation during this period is lost into the sea. Also, even during January, when no water is supplied for irrigation, sufficient water must be released at Aswan to keep the river at the level necessary for navigation - normally about 2300 million cubic meters, although the amount may be reduced somewhat if absolutely necessary.

This explains why the Egyptian Irrigation Service rates years when the discharge is in the neighborhood of 70,000 million cubic meters as "very low or standard" - "very low" because the water available is only enough to satisfy the requirements and must be carefully husbanded, and "standard" because, for that reason, it is the type of year used as the basis for classifying all other types. Usually two first steps are taken for water conservation when the March forecasts indicate a lower-than-average natural summer supply. These are (1) restriction of the area that can be planted to rice, because of the excessive amount of water required by rice as compared with other crops, and (2) postponement of the watering of the land that has been left fallow for the summer corn crop from April when it is most to be desired, to some time in July when the rising water has reached a safe volume.

STORAGE AND CONTROL PROJECTS

Although the water of the Nile is Egypt's lifeblood, Egypt itself contributes no part of it; no tributary joins the main Nile north of Egypt's southern boundary. Of its annual water supply the Nile of Egypt receives about 55 per cent from the Blue Nile, which has its principal sources, including Lake Tana, in the Ethiopian highlands; 15 per cent from the Atbara River, which rises in Ethiopia close to the headwaters of the Blue Nile; and 30 per cent from the White Nile, which receives about half of its discharge from the Sobat River, another stream fed chiefly by rains in the Ethiopian highlands; and the remainder mostly from the lakes of the Lake Plateau of East Central Africa. Consequently international cooperation has long been considered an absolute necessity, if storage and control are to be provided for in order that Egypt may appreciably expand its present cultivated areas or even, in years of low rainfall in one or more of the watersheds of the Nile's headwater tributaries, be assured a full water supply for the land now under cultivation.

Over-year Storage

If annual storage alone could satisfy Egypt's needs, the problem would be greatly simplified. But in the occasional years of very low water there is not enough to fill the storage reservoirs with the full amount of supplementary water to which the area at present under cultivation is keyed. Nor is annual storage nearly enough, if the cultivated area is to be increased and if one crop basin irrigation is everywhere to be replaced by perennial irrigation. What has come to be called "over-year" or "century" storage must be provided.

From the many schemes proposed for "over-year" storage, a comprehensive plan was finally evolved which, until recently, was generally accepted as best designed both to satisfy Egypt's needs and to provide such advantages to the other countries that must share in its execution as would make their cooperation a profitable investment. So far, the only cooperative measures undertaken for storage and control have been the Gebel Aulia and Sennar dams in the Anglo-Egyptian Sudan (now the Sudan Republic) and the dam completed in 1954 at the outlet of Lake Victoria in the Uganda Protectorate. The overall plan called for not only the further cooperation of the Sudan and Uganda but also that of Ethiopia, the Belgian Congo, and Great Britain's Tanganyika Territory and Kenya Colony.

Egypt seems now to have abandoned this plan, and all others involving international cooperation, except with the Sudan Republic - in favor of a new project - the so-called Aswan High Dam, which will be discussed later. It seems appropriate, however, to outline the discarded project here, partly to clarify Egypt's water problem, partly because the great estimated cost of the proposed Aswan Dam may necessitate a return to the older plan.

Sources of Main Nile Water

The White Nile.

The Blue Nile and the Atbara make their major contribution to the natural flow of the main Nile during its flood season, while the White Nile contributes most during the low-water season. When water is low on the White Nile, its main sources are Lake Victoria at the junction of Uganda, Tanganyika, and Kenya, and Lake Albert on the Uganda-Belgian Congo border; the Sobat River tributary of the White Nile, like the Blue Nile and the Atbara, is of little importance at this time of year.

Lake Victoria, with an area of about 69,000 sq. km. (26,640 sq. mi.), is exceeded in size among the world's fresh-water lakes only by Lake Superior (82,400 sq. km; 31,814 sq. mi.). With a greatest depth of about 82.5 meters (270 feet), it is, however, one of the shallower of the world's great lakes. The principal headwater stream of the White Nile, known as the Victoria Nile between Lake Victoria and Lake Albert, flows out of the north side of Lake Victoria over a low falls, Ripon Falls, and thence along some 80 km. (50 mi.) of falls and rapids, of which the largest is Owen Falls, 2.5 km. (1.5 mi.) from the lake. Beyond the rapids, through Lake Kioga and on to Murchison Falls, which drop about 46 meters (150 feet) in a narrow rock passage, the river is navigable for light-draft vessels. A few miles beyond the Murchison Falls it enters the northern end of Lake Albert.

About three kilometers two miles west of the mouth of the Victoria Nile, the Albert Nile, or as it is better known, the Bahr el Jebel (river of the mountains), flows northward out of Lake Albert. For the 160 km. (100 mi.) to the Fola Rapids, just below the Sudanese border town of Nimule, the Bahr el Jebel is a smooth-flowing stream, swampy but navigable; but below the rapids it is no longer navigable for another 160 km. to the town of Juba. Beyond Juba it is again navigable, but most of its course to Lake No, where the main stream of the White Nile begins, is through the great swamps the Sudd Region. In these swamps the Bahr el Jebel loses half the water that it would otherwise carry to the White Nile, and until a channel was cleared and steamboat traffic to Juba initiated early in the present century, passage by any sort of craft was frequently blocked by impenetrable accumulations of vegetation.

About halfway through the Sudd, a channel called the Bahr el Zeraf (river of giraffes) branches off from the Bahr el Jebel and follows the eastern border of the swamps to join the White Nile 78 km. (48 mi.) east of Lake No. It has been little used for navigation and is now in places completely choked with vegetation.

At Lake No the Bahr el Jebel water is joined from the west by that of the Bahr el Ghazal (river of the gazelles), the outlet of a system of streams that are torrential in flood but are so obstructed by swamp in their lower reaches that they make only a minor contribution to the water of the White Nile.

Downstream 123 km. (80 mi.) from Lake No the Sobat River enters the White Nile from the east. When the Sobat is in flood it ponds the water of the White Nile upstream as far as Lake No and beyond. Otherwise the volume of the White Nile above the mouth of the Sobat varies but little between the wet and dry seasons.[19] From the Sobat to its junction with the Blue Nile, the White Nile, under natural conditions, is a wide, quietly flowing stream in a shallow, gently sloping valley.

The Blue Nile and the Atbara.

There could scarcely be a greater difference than that between the White Nile and the Blue. In contrast to the even flow of the White Nile, the Blue Nile, fed by heavy rain in the Ethiopian highlands, increases its discharge from 120 cubic meters or less per second in April to as much as 7000 in September and not only plays the major role in the annual flood of the main Nile but impounds the water of the White Nile during that period. Owing to the filtering action of the Sudd Region, the impounding by the Sobat, and its own slow movement in its lower reaches, the White Nile is a clear-water stream; in contrast the Blue Nile when in flood is loaded with silt. This silt, combined with that brought down by the Atbara, has formed most of the rich soil of the Nile valley and delta.

The Atbara, fed also by rains in the Ethiopian highlands, rises as rapidly as does the Blue Nile and at approximately the same time. It subsides even more rapidly, and for about half the year is no more than a chain of pools.

White Nile Storage Proposals

The only aid for the irrigation of the Nile valley in Egypt so far in operation on the White Nile is the Gebel Aulia Dam. The plan for further storage of White Nile water, generally accepted as the best adapted to serve Egypt's needs, would provide not only for annual storage and prevention of loss of Victoria Nile water in the Sudd Region but also, and more particularly, for over-year storage. The works proposed were a dam at the outlet of Lake Victoria, a subsidiary regulator below Lake Kioga, the conversion of Lake Albert into a storage reservoir by the erection of a dam at some point on the upper Bahr el Jebel, controlling embankments through the Sudd Region of a diversion canal around it, and the possible heightening of the Gebel Aulia Dam.

The Lake Victoria Reservoir.

As already mentioned, the Lake Victoria Dam has been completed. This dam, at the Owen Falls about 2.5 km. (1.5 mi.) below the outlet of the lake, is 830 meters (2720 feet) long and 26 meters (85 feet) high and in addition to its water-impounding function, is designed to drive ten electrical units of 15,000-kilowatt production capacity. Of these units, one was installed in 1952 and five more were scheduled for installation by 1956. Installation of the remainder will await the development of a need for them. The dam will increase the potential height of the lake level by a maximum of 1.3 meters. At that level the lake will be the world's largest reservoir in area, with a surface of 43,300 sq. km. (15,720 sq. mi.). With its

estimated capacity of 100 billion cubic meters (about 80 million acre feet), it probably will be, also, the largest in capacity.

The Lake Kioga Regulator.

A subsidiary regulator barrage is proposed for construction a short distance below Lake Kioga. Its sole purpose would be to permit storage of sufficient water in the lake to effect, when the discharge from Lake Victoria is increased, an immediate corresponding increase at this regulator. Thus the delay of two or three months might be avoided, which would otherwise be required for the filling of Lake Kioga to the level that it would have to reach before it could pass on the increased flow from Lake Victoria to the lower Victoria Nile.

The Lake Albert Reservoir.

It was at one time generally considered that a better plan would be to locate the major storage reservoir so as to include Lake Albert and use the Lake Victoria Dam only as a supplementary regulator. With this in view, a dam was originally proposed on the Bahr el Jebel at the town of Nimule, just inside the Sudan Republic and 160 km. (99 mi.) below the outlet of Lake Albert. The advantage of a dam at this site, in addition to the size of the reservoir it would impound, is that it would also control the waters of numerous flood-season torrents which empty into the Bahr el Jebel between Lake Albert and Nimule. The Uganda government has objected to the Nimule site on the ground that much good land now under cultivation along the river would be flooded. No objection has been offered, however, to a dam at Mutir, about 70 km. (43 mi.) from the lake, where there is, as at Nimule, a suitable rock foundation.

No definite agreement was actually drafted as to the location and height of the Bahr el Jebel Dam. The Uganda government suggested, however, that it should be so constructed as to provide a maximum effective reservoir level of not more than about 9.5 meters above the lowest recorded level of Lake Albert. Since the lake lies between rather steep escarpments, increases in the water level would produce only small increases in surface area. On the other hand, since the area of the lake is about 5500 sq. km. (2100 sq. mi.), a rise in level of only one meter would produce a storage volume of some 5.5 billion cubic meters (4.45 million acre feet) or somewhat more than the present capacity of the Aswan Reservoir. [20]

Control in the Sudd Region.

The Lake Victoria Reservoir and the proposed Lake Albert Reservoir would be of little value to Egypt in relation to their cost, if their water were released only to be passed into the Sudd Region. Under present conditions, passage of water to the White Nile would not only be greatly retarded but a large proportion of it would be lost.

A number of proposals for the conquest of the Sudd Region have been advanced. Those most discussed and explored have been the embankment of the Bahr el Jebel and Bahr el Zeraf channels to prevent spilling into the swamps, a new channel dug inside or outside the swamps, or a combination of these two. Water might also be brought from the Lake Albert-Bahr el Jebel Reservoir

into the White Nile by way of the Sobat River, by digging a canal to connect the Victoria Nile above the Sudd with the Veneno tributary of the Pibor River, a large headwater affluent of the Sobat, but this route was early discarded as impracticable in view of the great amount of deepening and straightening that would be required on both the Veneno and Pibor.

Most generally favored in recent years has been what is known as the Jonglei Canal Diversion Scheme. In this scheme two alternative routes were proposed. Both would take off from the Atem River, a side channel of the Bahr el Jebel, at the little native village of Jonglei. One would be a channel dredged near the border of the swamps to enter the White Nile a little east of the Bahr el Zeraf mouth. The other would be a canal excavated outside the swamps and running more or less directly to an outlet into the White Nile at the mouth of the Sobat. The Sudanese government has been exploring these routes for several years and studying the possible effects on the present and future population of the area involved. Whether the dredged channel or the excavated canal were chosen, a barrage would be required at the entrance to regulate the amount of water released into the waterway. In either case the distance covered would be in the neighborhood of 300 km. (185 mi.), and either the task would require both tremendous capital outlay and labor force - difficult to recruit and maintain in this notoriously unhealthful region.

The swamps of the Sudd Region now serve as a safety valve when, in years of exceptionally heavy rainfall on the Lake Plateau, the lakes suddenly rise to abnormal heights. With the Bahr el Jebel water directed through the proposed diversion, such occurrences might have disastrous consequences in the Sudan and possibly even in Egypt, unless provision against them were included in the designing of Bahr el Jebel Dam and perhaps by increasing the height of the Victoria Dam.[21]

Blue Nile Projects

A Lake Tana Reservoir.

The Sennar Dam is the only regulatory work now in operation on the Blue Nile. Of a number of schemes which have been advanced for further storage of Blue Nile water, the damming of its Lake Tana source in Ethiopia has attracted most consideration, and argument, pro and con, among irrigation engineers. Lake Tana is a shallow lake with an area of about 3100 sq. km. (1200 sq. mi.). Although it contributes only about seven per cent of the annual discharge of the Blue Nile, for some fifty years the construction of a relatively low dam where the river leaves the lake over a series of cataracts has been the subject of a number of on-the-ground studies by missions from the Egyptian Ministry of Public Works. A hydrological study of the lake and its outlet was carried out in 1923-1924.

The Ethiopian government was sufficiently interested in the proposal, particularly in the hydroelectrical works suggested in connection with it (the air distance to Addis Ababa is only about 290 km.), to engage an American firm, the J. G. White Engineering Corporation, to carry out a survey between 1930 and 1934. A joint Egyptian-Sudanese delegation was discussing the proposal with representatives of the Ethiopian government at Addis Ababa when

the Italian invasion of 1935 put an end to the negotiations.[22]

Other sites for reservoirs on the Blue Nile in Ethiopia have been suggested. One, at the rapids where the Balas and Shar tributaries join to enter the main stream, would be only 65 km. (40 mi.) from the Sudanese border,[23] but a reservoir there would be of little present value to Ethiopia.

Supporters of the Lake Tana Reservoir scheme argue that (1) only by means of over-year water storage there can provision be made against the years of serious deficiency in the summer supply of water to the main Nile, which might occur even after the control and storage works planned for the White Nile were in full operation; (2) the reservoir could be drawn on in emergencies without great delay, since it takes little more than a month for water to travel from Lake Tana to the Aswan Reservoir; (3) the reservoir could be operated so as to expand the present irrigated area in the Gezira tract; and (4) it could substantially contribute to the protection of Egypt against excessive floods on the Blue Nile.[24]

Others, however, argue that since Lake Tana's contribution to the total annual flow of the natural river at the Aswan Dam is on the average no more than seven per cent the lake's waters are of no great importance in the annual regime of the main Nile. It is also argued that churches and other holy places around the lake just above its high-water level make any considerable raising of the level undesirable; the only other way appreciably to increase its storage capacity would be to lower the series of cataracts over which it discharges - an operation that would involve miles of costly channel cutting.[25]

A White Nile-Blue Nile Canal

Some study has also been given to heightening the Gebel Aulia Dam and cutting a large canal to it from above the Sennar Dam. The combination of such a canal and the increased capacity of the Gebel Aulia Reservoir would probably serve two important purposes. First, it would make it possible to supplement the White Nile contribution to the main Nile during the low-water period, by storing in the reservoir whatever might be needed of the Blue Nile water that now flows to the sea during the high-water period. Second, it would provide a sure means of protection for Egypt in years of excessive Blue Nile floods. In years of normal high water in the Blue Nile, as much of its top-level, and consequently least silt-laden, water could be released to the canal as might be needed in the Gebel Aulia Reservoir. In years of abnormally high Blue Nile floods, the total excess of water could be diverted to the reservoir.

Since it was originally intended that the Gebel Aulia Dam would be considerably higher than it now is, the base is wide and strong enough to support whatever additional height would be necessary. The chief argument against heightening the dam and cutting the canal has been that the cost, an estimated £E 7,000,000 (about $20,000,000 at the current rate of exchange), would be excessive. But it has been estimated that adequate flood control works in

Egypt would cost not less than £E 5,000,000, and would not provide any means of obtaining additional water for summer irrigation.

Other Storage Suggestions

Two sites, one on the Setit tributary of the Sobat River at the Ethiopian village of Gambeila, the other at Khashm el Girba on the Baro tributary of the Atbara River, have been proposed as suitable for small reservoirs that would afford a considerable measure of relief to the Aswan Reservoir, but neither has received more than a cursory examination.

Two projects for storage and flood protection on the main Nile itself have also been considered. For some time during recent years, a dam in the Anglo-Egyptian Sudan at the Fourth Cataract was an item in the overall scheme of the Egyptian government. This proposed dam would impound a reservoir of about 8 billion cubic meters (about 6.5 million acre feet) capacity, as compared with Aswan's 5.3 billion, and would extend, when filled, about 160 km. (100 mi.) to the town of Abu Hamed. The country that would be flooded is very sparsely populated and compensation would consequently be a minor item in the total cost.

The other project is for a reservoir for flood protection and perhaps some storage in the Wadi Rayan, a depression a short distance south of the Faiyum depression and 35 km. (21 mi.) west of the Nile. Long before the construction of the Aswan Dam began, the Wadi Rayan was seriously considered as the site of a reservoir to store water for the summer irrigation of the delta.[26] The lowest point of the Wadi Rayan is about 50 meters below sea level. The wadi could be made into a reservoir with a surface area of about 700 sq. km. (280 sq. mi.) when filled, by the construction of a barrage on the Nile and the cutting of a canal through the rocky ridge that separates it from the river. Some of the flood water diverted to it could be returned to the Nile by the same canal after the flood has subsided, or a second canal might be cut to a point lower down on the river.[27]

A New Aswan Reservoir

In 1947 the Ministry of Public Works instituted an overall study of the storage and control proposals described above and in 1949 approved a plan comprising the Lake Victoria Reservoir, the Sudd Diversion Canal, and the Lake Tana, Fourth Cataract, and Wadi Rayan reservoirs. Apparently, however, this entire plan, except for the Lake Victoria Dam already built, has been discarded in favor of enlargement of the Aswan Reservoir by the construction of a new and much higher dam about six kilometers four miles upstream from the present dam.[28] Since the present dam has been heightened twice, as already noted, no further heightening of it is considered possible.

The National Economic Planning Board, established shortly after Egypt was proclaimed a republic on June 18, 1953, has adopted the project, and plans and specifications are reported as well advanced. In the preliminary operations - aerial photography, topographic mapping, and geological

tests - a West German firm and the Foreign Operations Agency of the United States government played major roles. The German firm has drafted plans for the dam and its operation, and these are said to have been submitted to an international group of experts for final checking.

The 120 billion cubic-meter capacity of the reservoir (nearly 100 million acre feet), as planned, will be more than 20 times that of the present reservoir, which would make it the largest in the world (the capacity of Lake Mead, the next largest, is 31,142,000 acre feet). The planned dam will be 150 meters (492 feet) high and nearly five kilometers three miles long. The maximum storage level of the reservoir will be 180 meters (590 feet) above sea level, as compared with 121 meters (397 feet) in the present reservoir. When full, the reservoir will extend to the Dal Cataract, about 440 km. (273 mi.) above the dam and 150 km. (95 mi.) upstream beyond the Egyptian-Sudan border. It will thus flood much of the Nubian region, including the Wadi Halfa district of the Sudan Republic.

Purposes and Prospects.

The purpose of this greatly enlarged reservoir will be to store the water that is now lost to the sea during the annual flood period of the Nile. It is calculated that enough water will be stored greatly to increase the area under perennial irrigation, both by extending perennial irrigation to hitherto unirrigated tracts and by converting to it nearly 1,000,000 feddans that are now under one-crop basin irrigation. There will also be enough water to furnish to the whole area which will then be under cultivation not only the necessary supplement during normal low-water seasons, but also over-year storage to meet the deficits of years of low flood. Moreover, the entire flow of water below the dam will at all times be controlled, with the right amounts of water for the different crops supplied at the right times - an important factor in both yield and quality. For example, the plans include the provision of water for about 700,000 feddans of rice, a crop for which there is good demand but one that requires so much water that it is the first to be limited in low-water years.

The tremendous storage capacity of the proposed new reservoir will, it is hoped, eliminate the flood menace and consequently the labor and constant vigilance now required to keep the flood banks of the river and canals in repair. Although the plans for the operation of the new dam call for the constant maintenance of levels adequate for navigation on the Nile and all navigable canals, they also require the ending of the free flow of water that is now permitted during each flood season until the filling of the present Aswan Reservoir is begun. This should lower the ground-water table generally and correspondingly reduce the danger of waterlogging. Drainage will consequently be a much less serious problem than at present.

Another function of the new dam, and by no means the least important, will be the generation of hydroelectrical power. The present design calls for the installation of generators with a total potential of about 10 billion kilowatt-hours per year. Complete control of the Nile water will also permit hydroelectrical generation at river and canal barrages, since these will have to be kept in operation at all times to maintain the proper differences in level.

Since the plans for the new dam call for complete, year-round control of all the Nile water coming into Egypt, storage in its reservoir will have to begin much earlier in the flood season than has been considered possible in the present reservoir owing, as we have seen, to the risk of silting from the Blue Nile and the Atbara. Silting in the greatly enlarged reservoir will not, it is estimated, reach dangerous proportions for five hundred years.

The promoters of the new dam project believe that with the storage capacity of the new reservoir and the control of the Nile water which this will make possible some 2,000,000 feddans may be added to the 7,800,000 feddans that irrigation experts have long considered to be the maximum area for which water could be provided for perennial irrigation. This addition would be made by supplying water by canal and pump to desert land lying not more than 20 meters (65.6 feet) above the highest level now reached by irrigation water, as shown in the following table:

Table 2 - Cultivable Land above Present Irrigation Limits(in feddans)

	To 10 meters	10 to 20 meters
Valley border	1,140,000	360,000
Delta border	420,000	310,000
Total	1,560,000	670,000

Cost and Financing.

The cost of the projected dam is estimated at £E 180 million (about $516 million at the current rate of exchange). Early in 1956 it was announced that the United States would advance $56,000,000 toward the financing of the first five-year stage of the construction work and that Great Britain would contribute $14,000,000 in the form of blocked sterling owed Egypt for goods supplied and services rendered during and after World War II. The International Bank for Reconstruction and Development also expressed readiness to lend up to $250,000,000, contingent upon a definite agreement between Egypt and the Sudan Republic with regard to both water distribution in Sudan from the reservoir and compensation for the land and villages that would be inundated. [29]

No such agreement has ever been concluded, however, and as far as is known discussions between Egypt and the Sudan have not even been initiated. Furthermore, only a few months after these loans were promised, President Nasser committed a large part of Egypt's future cotton profits to purchase arms from the Soviet bloc. On the ground that Egypt's economy could not, under such circumstances, bear the burden of so heavy a loan and so large a capital expenditure, on July 19,1956, the United States announced that its offer of financial aid to assist in the financing of the dam was withdrawn, and the

British government and the World Bank immediately followed suit.

On July 26, when President Nasser of Egypt declared the nationalization of the Suez Canal Company, he announced that subject to whatever arrangement his government might decide on for compensating the stockholders in the Canal Company the profits for the operation of the Canal - about $100,000,000 a year - would be applied to the construction of the new dam.

NOTES

1. For a thorough discussion of basin irrigation (with numerous maps and diagrams), see W. Willcocks: Egyptian Irrigation, London and New York, 1889, pp. 36-88. See also H. E. Hurst: The Nile: A General Account of the River and the Utilization of Its Waters, London, 1952, pp. 38-41.

2. A feddan is 1.038 acres. 3. Hurst, op. cit., p. 43.

4. See H. E. Hurst: A Short Account of the Nile Basin, Physical Dept. Paper No. 45, Cairo, 1944, pp. 54-56; and for detailed discussion of the problem of drainage, see Julien Barois: Les irrigation en Égypte, Paris, 1911, pp. 205-238.

5. See Willcocks, op. cit., pp. 147-148.

6. For detailed description of this barrage, with drawings of its construction, see Willcocks, op. cit., pp. 146-169; and Barois, op. cit., pp. 314-331.

7. Y. M. Simaika: Filling Aswan Reservoir in the Future, Physical Dept. Paper No. 42, Ministry of Public Works, Cairo, 1940, p. 37.

8. Barois, op. cit., p. 185.

9. For a detailed history of the Ibrahimiya Canal, the Asyut Barrage, and the original building and first heightening of the Aswan Dam, see Barois, op. cit., pp. 338-381. For a description of the environs of the Aswan Dam and Reservoir and a discussion of its geology, physiography, and history, see John Ball: A Description of the First or Aswan Cataract of the Nile, Survey Dept., Ministry of Finance, Cairo, 1907.

10. Hurst: The Nile: A General Account, op. cit., pp. 30-31.

11. Barois, op. cit., p. 113. 12. Simaika, op. cit., p. 27.

13. Simaika, op. cit., p. 5.

14. For further details of the functions and operation of the Sennar Dam, see J. D. Tothill, ed.: Agriculture in the Sudan: A Handbook of Agriculture as Practised in the Anglo-Egyptian Sudan, by various authors, London, 1948, pp. 598-611.

15. H. E. Hurst: The Nile Basin, Vol. 3: The Hydrology of the Sobat and the White Nile and the Topography of the Blue Nile and Atbara, *Physical Dept. Paper No. 55*, Ministry of Public Works, Cairo, 1950, pp. 84-96. See also F. Newhouse: The Training of the Upper Nile, London, 1929, p. 79.

16. For further details of the organization of the Irrigation Service and its operation and copies of the legislative acts and executive edicts governing all aspects of the control and use of irrigation water, see P. M. Tottenham: The Irrigation Service, Its Organization and Administration, Ministry of Public Works, Cairo, 1927.

17. See Tottenham, *ibid.*, pp. 34-75.

18. Newhouse, *op. cit.*, p. 18.

19. Sir Henry G. Lyons: Irrigation in Egypt, *Geography*, Vol. 15, No. 85, September, 1929, pp. 179-185.

20. Sir Murdock MacDonald: Nile Control Works: Notes on a Series of Control Works to Regulate the Irrigation Water Supply of the Nile Valley, Ministry of Public Works, Cairo, 1920, p. 11.

21. Hurst: The Nile: A General Account, *op. cit.*, pp. 303-304.

22. *Ibid.*, pp. 98 and 288.

23. See Major R. E. Cheesman: Lake Tana and the Blue Nile: An Abyssinian Quest, London, 1936, pp. 360-361.

24. H. E. Hurst, R. P. Black, and Y. M. Simaika: The Nile Basin, Vol. 7, The Future Conservation of the Nile, *Physical Dept. Paper No. 51*, Ministry of Public Works, Cairo, 1946, pp. 92-106.

25. Newhouse, *op. cit.*, pp. 83-85.

26. See Willcocks, *op. cit.*, pp. 303-322.

27. Hurst: The Nile: A General Account, *op. cit.*, p. 315.

28. Plans for this new dam and the results that are envisaged in expansion of the area of cultivable land in Egypt, flood control, and hydroelectrical generation are presented in two publications (in Arabic) issued in July, 1954, by the National Economic Planning Board of Egypt: "The Project of the Aswan Reservoir" and "Water Policy and Plans for Expanding Cultivation."

29. New York *Times*, June 24, 1956.

COTTON AND OTHER FIBER CROPS

INTRODUCTION

"It is impossible to minimize the extent to which everything in Egypt depends on cotton. One can see no other crop which would support the present population ..." Thus writes C. H. Brown, who during his thirty years' service with the Botanical Section of the Ministry of Agriculture of the Egyptian government played a leading role in developing and perfecting the varieties that have raised Egyptian cotton to its present preëminent position in the world market for high-quality fiber. [1] Cotton is the pivot of Egyptian economy and the basis on which its financial system operates, normally accounting for nearly half the value of the country's agricultural production and contributing about 85 per cent of the value of its exports.

Except for the relatively small sections where sugarcane is the leading summer crop, all other agricultural activity is centered around the cotton crop, wherever water for summer irrigation is supplied. Cotton is the basis of the agricultural year and crop rotation. It is to cotton that Egypt owes the development of its present efficient irrigation system, and the cotton crop has paid for its construction.

Restrictions on the area to be planted in cotton have been imposed by government edict at various times, as during World War II, when the difficulty both of exporting cotton and of importing food made it necessary to devote a greater area than usual to grain crops; but under normal conditions cotton occupies about 60 per cent of the area planted to summer crops and 20 per cent of the total crop area (the total area planted to summer, autumn, and winter crops).

The preëminence that cotton has attained in Egyptian agriculture is the result of a number of factors. The suitability of Egypt's soil and climate to cotton growing is close to perfect. Such is the basic fertility of the deep silt laid down by the Nile and so responsive is it to chemical fertilization, that Egypt's cotton yield is the highest in the world - an average of 536.8 per feddan (517 per acre) for the ten-year period 1940-1949, as compared with 267.6 per acre in the United States. A staff of experts has long carried on experiments and trials to develop by genetic build-up cotton types that are both best adapted to the environment and in greatest demand in the market for high-quality fiber. They have developed long-staple varieties that have no rivals for fiber length and quality, except the Sea Island cotton produced in limited quantities in the West Indies. Finally, low-priced labor is available in such supply that Egyptian cotton can be given a degree of care impossible where labor is scarce or high priced.

Egypt ranks fourth, after the United States, the Soviet Union, and India, as a leading cotton-producing nation, or fifth after China some years, if available figures on China's production are to be relied upon. But its annual cotton planting averages only 2,000,000 acres, as compared with an average of about 27,000,000 acres planted in the United

States during that time, and it produces only between five and seven per cent of the total world harvest.

The average cotton yield has varied considerably over the years. There was a decided drop during the early years of this century, owing chiefly to the eagerness of both government and grower to expand the cotton area on newly reclaimed land. Invasions of the pink boll weevil, with which the growers had had no previous experience, also reduced yields. However, from 1930 on, although there have been some poor years, on the whole yields have improved fairly steadily. Thanks to high-yielding varieties, improved rotation practices, and intensive use of chemical fertilizers, the yield in 1948 reached 6.17 qentars (617 pounds) of ginned cotton per feddan in 1948. Since then there has been a rather serious decline, as shown in Table 1, owing partly to expansion of the cotton area on land that was depleted by heavy cropping with little fertilizer during the war, and partly to infestations of insect pests.

HISTORY

How early cotton textiles may have been used in Egypt is not known; no evidence of them has been found in the early tombs, but this may be due to the fact that only linen seems to have been used for burial wrappings. At any rate cotton appears to have been in general use during the reign of the Ptolemys (323-30 B.C.). [2] The scientists and historians who accompanied Napoleon on his invasion of Egypt in 1798 reported two entirely different species of cotton widely cultivated - a long-staple and possibly indigenous perennial tree cotton in the Nile valley and a short-staple annual type of obviously Asiatic origin in the delta. [3]

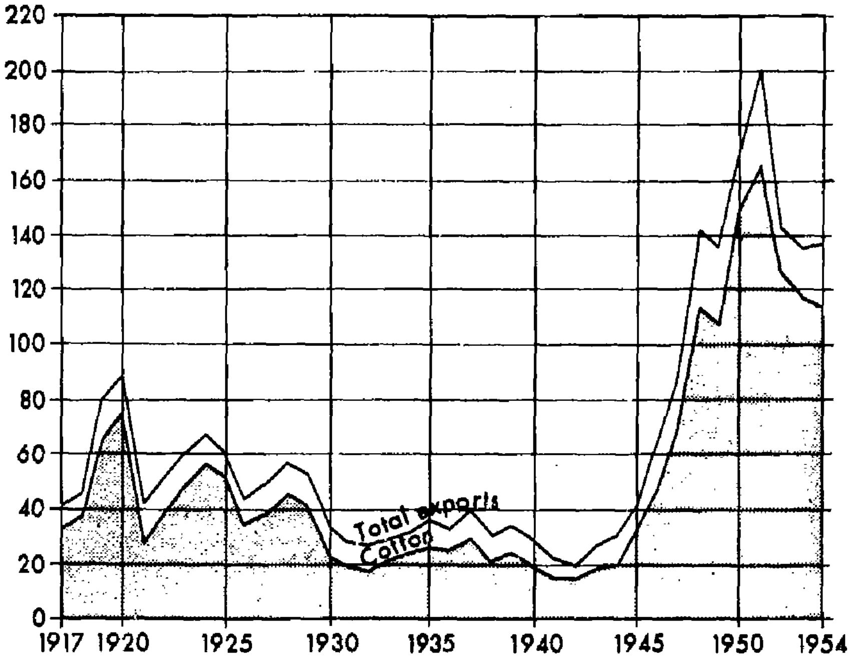
Beginnings of the Present Industry

Modern cotton growing in Egypt dates from the early 1820's, when Jumel, a Franco-Swiss textile expert employed by Mohammed Ali, Governor-General from 1805 to 1849, induced his employer to try out in the delta the indigenous tree cotton of the valley. Mohammed Ali was already deep in plans to develop the cotton-growing industry in the delta; in 1816 he had begun to deepen the canals from the delta branches of the Nile so as to ensure a year round flow of water to his cotton plantings. The long, strong fiber of the tree cotton was so superior to the short-staple cotton, and so rapidly propagated, once Mohammed Ali was convinced of its merits, that the short-staple variety was speedily driven from the delta.

As interest in long-staple cotton developed, other varieties were imported for trial. Among them was the annual Sea Island cotton from the West Indies, which is today the only real rival of Egyptian long-staple cotton in the world market. Sea Island cotton as such never did particularly well in Egypt, but it was one of the most important of the many ancestors that have contributed their genes to the new cotton types developed there. [4]

SHARE OF COTTON IN THE TOTAL VALUE OF EXPORTS OF EGYPT

(Value in L. E. Million)



PERCENTAGE SHARE OF COTTON IN THE TOTAL VALUE OF EXPORTS OF EGYPT

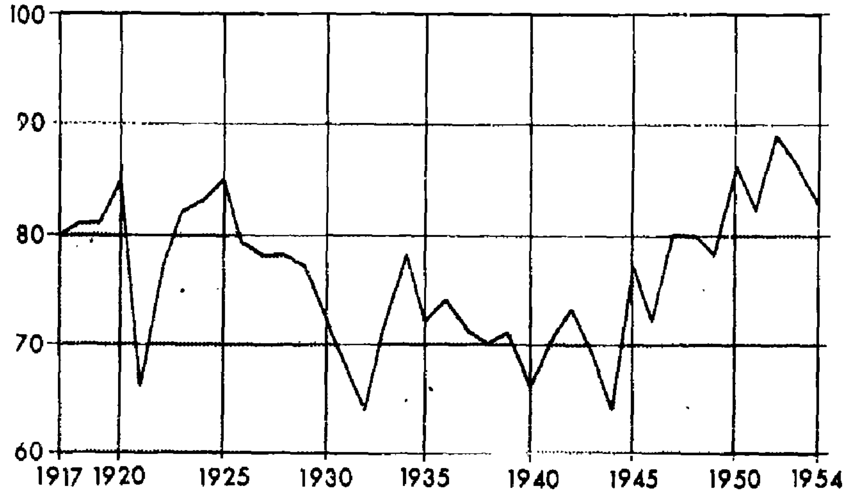


Table 1 - Cotton Planting and Production

(Area in thousand feddans; production in thousand qentars)

Year	Area	Production	Yield (qentars per feddan)
1930	2,082	8,276	3.97
1931+	1,683	6,357	3.78
1932*+	1,094	4,956	4.53
1933	1,084	8,575	4.75
1934	1,732	7,555	4.36
1935	1,669	8,535	5.11
1936	1,716	9,107	5.32
1937	1,978	11,009	5.57
1938	1,784	8,340	4.67
1939	1,625	8,692	5.35
1940	1,684	9,170	5.44
1941	1,644	8,374	5.09
1942*	706	4,233	6.00
1943*+	713	3,569	5.00
1944*+	853	4,640	5.44
1945*	982	5,221	5.31
1946*	1,212	6,066	5.01
1947*+	1,254	6,370	5.08
1948	1,441	8,900	6.17
1949	1,692	8,704	5.14
1950	1,975	8,500	4.30
1951	1,979	8,076	4.08

* years of restricted cotton area.

+ years in which certain varieties were limited to particular zones.

1 feddan = 1.038 acres.

1 qentar of ginned cotton = 100 pounds

Mohammed Ali kept his plantings of the various types carefully separated for some time, but with war and other matters of state commanding his attention, his control of the seed supply was eventually relaxed. Cross-fertilization, partly natural and partly controlled by expert cotton breeders, developed the brown, short-staple Ashmuni, an annual which was for many years the most widely planted variety throughout the valley and delta. Ashmuni did not relinquish its leadership until the end of the nineteenth century, and modified by a lengthy regime of crossing, selection, and purification, it still reigns supreme in the Nile valley. Tree cotton was entirely discarded in the cotton-breeding program, mainly because of its great susceptibility to insect pests, but also because annual varieties are better adapted to cultivation and fertilization.

Steps to Present Preëminence

The rise of cotton to its present preëminent position in Egyptian agriculture dates from the blockading of the Confederate ports during the Civil War in the United States. Egypt's response to the resulting shortage of cotton for the English mills was little short of phenomenal, particularly in view of the fact that the perennial irrigation system was still in an early stage of development. In 1862, 1.8 million qentars (about 90,000 tons) were exported as compared with a crop of only 800,000 qentars (40,000 tons) in 1850. In 1865, 5.5 million (275,000 tons) were exported.

With the return of American cotton to the European market, the demand for Egyptian cotton declined, but the superiority of Egyptian cotton was so generally recognized that the decline was neither serious nor of long duration. By 1879 production was again up to three million qentars and in 1895 to over five million. From then on to 1925, when 7,965,000 qentars were produced on 1,924,000 feddans(an average of about 400 pounds per acre), there was a fairly steady expansion in the area in cotton. The only exceptions were two brief periods when for economic reasons planting was restricted by government edict. These were during World War I, when both the slump in market demands and the shortage of food imports made it imperative to turn more land to food production, and during the postwar depression of the early 1920's. Since 1925 the area planted has been restricted several times - in 1927-1929 and in 1931-1932 - as the result of slumps in market demand, and for a six-year period during and following World War II.

Restrictions were severe during World War II and were not relaxed appreciably until 1946. Not only was there no market for Egyptian cotton but there was little food for import or shipping to carry it. From 1942 to 1944 the area permitted for cotton was no more than 22 per cent of the perennially irrigated land in the northern provinces of the delta and 15 per cent of the remainder. The growing of cotton on basin irrigation land was completely forbidden. The supply of commercial fertilizers was so short that the entire stock was taken over by the government and could not be used on cotton land. The area in cotton fell from 1,664,000 feddans in 1941 (19.3 per cent of the total crop area) to 706,000 in 1942, and production declined to the average during the Civil

War period. To save the cotton farmers from bankruptcy the government was obliged to buy a total of some 9,000,000 qentars (450,000 tons) of cotton.

Fortunately for Egypt, the crises passed quickly after the end of the war, largely as the result of poor crops of long-staple cotton in the United States and the resulting demand there for Egyptian cotton. By 1949 stocks were down to normal and cotton planting was booming again. In 1951 it was up to 1,979,000 feddans (nearly 23 per cent of the total crop area).

How important cotton is to the Egyptian farmer is indicated by the fact that it was the only crop that did not show a decline in average yield per unit area during the war, in spite of the discrimination against it in the rationing of commercial fertilizers. Farmers gave it the maximum care during this period, and it is suspected that the poor yield of grain crops on many a farm during this period resulted from the use on cotton of the fertilizer allotted for grain growing.

In the future as in the past, however, the prosperity and even the stability of the Egyptian cotton industry will depend less upon farming skill and government zeal than upon world market factors beyond Egyptian control. Egyptian cotton has justly acquired a reputation for high quality, but unless Egypt's growers can keep prices down, their markets may be captured in the long run by synthetic fibers. Compared with man-made fibers, the consumption of cotton has increased only slightly since the 1930's; indeed, the proportion of cotton in the total world production of fabrics dropped from 86.8 per cent in 1913-14 to 70.7 per cent in 1951-52.[5] Competition from synthetics has hit cheaper grades of cotton hardest, but technological improvements now threaten the position of high quality, long staple cotton as well.

The Role of the Cotton Breeder

Cotton variety development since 1912, when a Department (later Ministry) of Agriculture and the Giza Research Farm were established, has been carried on by expert cotton breeders in government employ. Earlier progress in type improvement was largely a matter of uncoordinated effort on privately-owned or government plantations, and consisted of selection and seed importation rather than control and experimentation. Controlled research on a large scale began with the employment, early in the present century, of a group of British experts by the Khedivial (later the Royal) Agricultural Society; from these the nucleus of breeders at the Giza farm was drawn.[6]

Only since 1920, when the newly formed Cotton Research Board began to keep accurate records, can the development of cotton varieties be traced in detail; information on operation and results previous to that date is sketchy at best. By 1920, however, plantings of two varieties far outdistanced all the rest: the short-staple Ashmuni in the valley and the long-staple Sakel in the delta. Of 1,827,868 feddans planted that year, Sakel occupied 64 per cent and Ashmuni nearly 24.

Many new varieties have since been developed; some of them never achieved even brief acceptance and others had considerable periods of seeming triumph only to be finally discarded, as shown in Table 2 (copied by permission from Brown, op. cit., p. 124).

The Giza Varieties.

Many of the promising new varieties tried out for cultural suitability and market acceptability have been of the Giza strain (so named from the research farm where they were developed) and are commonly differentiated by number only. A few widely accepted varieties have been given distinctive names. Giza varieties Karnak (Giza 29) won immediate approval for its fiber fineness, length (40 millimeters), and strength; it is now the cotton most in demand for the manufacture of high-quality cotton goods. Its high resistance to the *Fusarium* fungus and its type stability, early maturation, and superior yield have made it no less attractive to the delta growers of long-staple. Since 1943 it has held the leading position there and since 1952 it has occupied about half of Egypt's total cotton area. Another Giza variety, Giza 59, has proved equal to Karnak in most respects and better in some; it is yet to be market tested. At present Karnak's only rival in the delta is Minufi (Giza 36), which occupies between seven and eight per cent of the delta land planted to long-staple.

Minufi's chief fault, great variability in tint, appears to have been mostly overcome. Otherwise, only its slightly shorter fiber makes it inferior to Karnak. It is the earliest maturing Egyptian cotton ever put on the market, and can usually be picked before the boll weevil invasion has reached serious proportions. It is close to Karnak in fiber strength and yields up to 12 per cent more lint.

Ashmuni.

The one cotton variety that has survived in Egypt since reliable records have been kept is the Ashmuni. A coarse, short-staple (32-millimeter) cotton, it has been known since the 1850's and for the past 40 years has led all other varieties planted above the delta; it now occupies more than 99 per cent of the valley land planted to cotton. In the delta, too, it is the only short staple cotton to which any significant area is planted. Although the delta type was at one time thought to be a separate variety and for that reason was given a name of its own (Zagora), it is now known to be Ashmuni, and the seed supplied to the delta growers is commonly obtained each year from valley ginneries. The name Zagora has been retained, however, for marketing reasons.

The chief virtues of Ashmuni are its almost complete immunity to wilt and its prolific flowering; in spite of the fact that it also sheds its flowers heavily, not until the 1930's did any substitute outyield it. Many of the Giza types have been developed from Ashmuni selections, and several of them have proved superior to it, but Ashmuni has been so long established with both the Egyptian cotton growers and the European spinners of coarse yarns that efforts to replace it have so far failed.

Table 2 - Development of Egyptian Cotton Varieties

(Areas planted in thousand feddans)

Variety	1910	1920	1930	1940	1950
Afifi	1,011	74	-	-	-
Ashmuni & Zagora	292	429	936	891	848
Yoannovitch	209	2	-	-	-
Nubari	97	23	-	-	-
Abbasi	22	4	-	-	-
Sakel	-	1,270	837	88	-
Pilion	-	-	124	-	-
Ma'arad	-	-	66	83	-
Giza 3	-	-	36	-	-
Fouadi	-	-	33	-	-
Nahda	-	-	25	-	-
Casuli	-	-	10	-	-
Giza 7	-	-	5	518	-
Sakha 4	-	-	-	26	-
Giza 12	-	-	-	41	-
Malaki	-	-	-	31	-
Karnak	-	-	-	6	683
Minufi	-	-	-	-	57
Giza 30	-	-	-	-	384
Others	10	25	9	0.6	2
Total	1,642	1,827	2,082	1,684	1,975

ROLE OF THE GOVERNMENT

Since cotton is the backbone of Egyptian economy and since Egypt's elaborate system of irrigation works has been developed by the government primarily to provide water for cotton growing, it is understandable that the government should exercise a considerable measure of control over the area allotted to cotton each year and concern itself with the development of varieties. Government participation in the cotton-growing industry is handled by departments of the Ministry of Agriculture, mainly through eight technical sections of the Ministry's Department of Agriculture.

Variety Breeding

All work of breeding, developing, and perfecting new cotton varieties is handled by a Botanical Section, most of whose operations are carried on at the research station and farm at Giza, just across the Nile from Cairo. Laboratory facilities at Giza are provided in a building opened in 1920. The same building houses some technical sections concerned with cotton research and the offices of an advisory laboratory research committee. Many of the technical sections have been moved to the Ministry's present headquarters at Duqqi, but the Botanical Section is still housed in the Cotton Research Board building.

Seed: Propagation and Distribution

Once a new cotton variety has been established, a Seed Propagation Section takes over the task of further propagation of nucleus stocks to provide enough pure seed for commercial growers. Each variety is allotted to a separate small government farm or to isolated units of 200 to 300 feddans on the larger farms. How long this nucleus propagation of a particular variety is continued generally depends on its seed productibility and the space available for it; but varieties which win early grower and market acceptance and for whose seed there is consequently heavy demand may be propagated for several years. All seed from the propagation plantings is ginned at the government ginnery at Sakha.

Surplus seed from the plantings of the Seed Propagation Section is sold by a Seed Distribution Section to selected growers, under a contract which provides for government supervision of the whole growing process from sowing to harvesting. Seed so distributed normally supplies about a tenth of the total demand. All other seed for sowing is also under government control, whether produced on government or privately-owned farms. This control applies, however only to seed purity; the government exercises no control over the varieties planted, although at times an attempt is made, not too successfully, to limit the planting of particular varieties to specific districts. Since in general the grower sells his cotton unginned, seed from privately owned cotton plantings is usually offered for sale by the ginneries; but no seed for sowing can be offered for sale unless it has the approval of the Ministry of Agriculture through its Seed Testing Section. Seed to be

submitted for such approval must be put into new sacks as it comes from the ginnery. Samples are then tested for purity, and if they pass the test, the sacks are sealed with the Ministry seal. Tests for germination are also run, but they are for the record only and are not required for official approval.

Soil Improvement and Disease and Pest Control

Soil analyses are conducted by a Chemical Section of the Department of Agriculture, as are studies of the causes of and remedies for soil deterioration. The actual work of testing fertilizers and organic manures is in the hands of an Experiments Section which also runs various cultivation experiments. These tests and experiments are carried out mostly on government farms, of which there are now two in the delta and four above the delta, totaling about 10,000 feddans and administered by a Government Farms Section of the Department.

Fungus diseases of the cotton plant have been in the past the subject of much study by both a Mycological Section of the Department of Agriculture and the Ministry's separate Department of Plant Pathology, but their work in this field has been largely eliminated by the development of immunity or high resistance in the cotton varieties now grown. Research on insect pests and measures for combating them are carried out by an Entomological Section in the Department of Plant Protection, but the actual field operations are directed by an Inspectorate Section in the Department of Agriculture. Statistics on areas of cotton planting, yield, and so forth, are collected and published by a Statistical Section in the Economics Department of the Ministry of Agriculture. A Cotton Department in the Ministry of Finance handles all statistics on prices, export sales, and home consumption.

The Cotton Inspectorate

From the standpoint of personnel, the largest section in the Department of Agriculture is the Inspectorate Section, which consists of a Director, two Assistant Directors (one for Lower Egypt and one for Upper Egypt), and a staff of inspectors (one for each of the smaller political provinces of the country and two or more for some of the larger provinces). Each inspector has a staff of supervisors, generally one for each of the administrative districts of his province. The duties of the inspectors are many. Theirs is the responsibility for enforcing (or attempting to enforce) the agricultural laws. It is to them that the Ministry looks for current reports on crop conditions, and they are the source of the information on which production estimates are based. They supervise the ginning of the sowing seed and conduct campaigns against insect pests.

COTTON ROTATION

As has been noted, Egypt's elaborate system of irrigation works was developed to provide water for cotton growing, since a large part of the cotton-growing season (March-October), and particularly the period when the water requirements of the young cotton plants are greatest, coincides with the low-water period of the Nile. Conversely, only the high yields of cotton in Egyptian soils and the high rating of Egyptian cotton in the world market have made it possible for the government to meet the high cost of constructing, operating, and maintaining these irrigation works. Consequently, wherever perennial irrigation is practiced, except in the relatively small areas where sugar cane or rice is the basic summer crop, the whole system of crop rotation is so organized as to get the best and most frequent cotton harvests while still maintaining optimum soil conditions. The rotations generally followed are (1) a biennial rotation in which one crop of cotton is produced on the same land once in every two years, or (2) a triennial rotation in which the cotton crop is repeated only once in three years.

For biennial rotation the cultivator usually divides his land into two more or less equal parts. On one of these the year's crop will be berseem (Egyptian clover, Trifolium alexandrinum) grown for fodder followed by cotton, while on the other during the same year, winter cereals (wheat or barley) and legumes are followed by corn, sorghum, or rice after a brief fallow period. The following year the procedure is reversed, with clover and cotton planted on the part of the land that had grown crops the previous year, and vice versa.

For triennial rotation the cultivator usually divides his land into three parts, growing clover and legumes followed by cotton on one, while on the other two he grows clover and winter legumes or winter cereals, followed after a brief fallow period by corn. He also shifts his plantings from part to part each year so that in a three-year period all will have been once under the same set of crops.

Crop periods in the two rotations are normally as shown in Tables 3 and 4.

Of the two rotations, the triennial with its two periods of clover and legumes and two fallow periods every three years is the better from the standpoint of soil maintenance and cotton yield. This rotation is commonly practiced on large estates where the land is worked under general management rather than under lease to small cultivators. Biennial rotation on the other hand is the standard with small cultivators, whose cash return is small enough when their land yields a cotton crop only once in two years. Actually the small cultivator is caught between the upper and nether millstones; he realizes that cotton is soil exhaustive and that his land needs revitalization by fallow periods and clover and other leguminous crops, but he cannot afford to give up the annual cash return from cotton. However, since World War II there has been a considerable trend toward triennial rotation even on the part of the small farmer.

Table 3 - Biennial Crop Rotation

Year	Period	Crop
1st	November-February March-October	clover cotton
2nd	November-May June-July July-November	winter cereals fallow corn, sorghum, and rice

Table 4 - Triennial Crop Rotation

Year	Period	Crop
1st	November-February March-October	Clover, legumes cotton
2nd	November-May May-June July-November	clover, winter legumes fallow corn
3rd	November-March April-May June-November	winter cereals fallow corn, sorghum, rice

COTTON CULTIVATION

Planting

Of the area planted to cotton in normal years, sixty per cent is in the delta, where it occupies about a third of the total crop area, mainly in the middle and northern provinces of Gharbiya, Fouadiya, Beheira, Daqahliya, and Sharqiya. Cotton growing in the delta thins out in the northernmost districts where drainage is difficult and the water table is high, and also toward the desert where the encroachment of desert sand in the alluvium greatly increases the water requirement. In the valley, the four northernmost provinces have twenty per cent of the cotton area, nearly half of it in Minya. In the southernmost provinces of Qena and Aswan, although some cotton is grown, sorghum and sugar cane replace it as the leading summer crops under perennial irrigation.

The average date for cotton planting in Egypt is early March, but cotton seed and the young plant are so sensitive to even slight temperature differences that there is considerable variation in planting dates. In the southern end of the cultivated valley cotton is usually planted as early as the first week in February. In the northern part of the delta planting does not begin ordinarily until late March, and rain, scant though it is, sometimes delays soil preparation so that the seed cannot be put into the ground until early April. However, it is desirable to get the plants started early enough so that the crop matures before the boll weevil invasion reaches its height, and with that in mind a delta cultivator will sometimes plant as early as late January; but he runs the risk that the soil may prove too cool for good germination and that he will have to replant.

The small cultivator still uses the primitive wooden plow, which only digs a furrow and does not turn it (see Chapter 4, Agriculture). To work up the soil thoroughly he commonly plows two or three times in different directions. The ground is then smoothed with a crude drag and finally worked up into low ridges for the cotton rows, with ditches between them for irrigation. Tractors equipped with modern tillage attachments are widely used on the large estates where areas of considerable size are cultivated under owner management, but tractor cultivation is not likely to be extended to small holdings unless some form of cooperative operation is developed.

The cotton-row ridges are run east and west, and the seed is planted about half way up their south sides in order to assure the fullest benefit of the sun for germination and early growth. Planting is done by hand, for the most part by children armed with sharp sticks for making the holes. The common practice is to plant the seed before the first watering. This makes for greater ease of planting than would be the case if watering were done previous to planting. The planters can walk in the dry ditches, and the covering of the seed can be left to the sifting of the dry soil into the seed holes. The irrigation ditches are filled for the first time immediately after a field is planted.

Planting is usually close and seeding is heavy - 15 or 20 seeds to a hole. When the young plants have made a good start they are thinned to two of the best to a hill. Even with such heavy seeding the first sprouting is apt to be somewhat spotty; reseeding to fill blank spaces is the rule. Failure of germination is not thoroughly understood, but too low ground temperature and the ravages of the mole cricket are contributing causes. "Sore-shin," caused by the damping off fungus *Rhizoctonia*, often takes serious toll of young plants when the seed has been planted unseasonably early. Better initial stands can be obtained by more careful planting and by watering just before the planting, but the small cultivator is not easily induced to change to a method that may require both more time and more skill.

Use of Fertilizers

Even the smallest cultivator knows the cotton plant is soil depleting and depends heavily on chemical fertilizers. The general practice of using animal manure for cooking fire leaves little, if any, to be applied to the land, and there is no plowing under of green manure. Much clover is planted in the rotation process, but the holdings of the great majority of the cultivators are so small that they need all of it for livestock fodder. On the other hand, the value of preceding cotton planting with a crop of clover or other legumes is generally recognized.

Nitrogenous fertilizers are used almost exclusively by practically all cotton growers for side dressing the young plants. Chilean nitrate of soda was long the favorite, but in recent years the importations have been mostly synthetic nitrate of lime from Germany. A plant at Suez produces nitrogen fertilizer by fixation from the air, but its output is small in proportion to the requirement. The plans for a new dam at Aswan (see Chapter 5, Irrigation) include fixation plants of sufficient capacity to supply all the country's needs.

Cultivation and Water Rotation

Because of the ridge and ditch method of cotton growing, all cultivation is by hand hoeing and weeding. There is at least one hoeing before each watering until the plants are too large to be worked without injury. Rogueing is carefully done in order to eradicate *Hindi*, a short-staple weed cotton, which seems to reseed itself however pure the sowing seed may be. Rogueing seems to be successful with all the long-staple varieties of cotton, but the apparent impossibility of eradicating Hindi in plantings of the short-staple Ashmuni is so well recognized that a small percentage of its seed is permitted in Ashmuni seed by the official seed testers.

Generally the second watering of cotton is applied about three weeks after the watering at seeding time. Thereafter the standard eighteen day rotation is followed, in which the distributary canals are full for twelve days and empty for six. In years of exceptionally low water, however, it may be necessary either to lengthen the dry period in one or more rotations or to decrease the amount of water

supplied during some of the watering periods. This is particularly apt to be the case with the cotton plantings at the ends of the canals in the northern part of the delta, where pumps are much used even in years of normal water supply. On the other hand, even where water is ordinarily ample for the standard rotation, more and more of the larger estates are installing tube-wells and pumps to lengthen the watering periods of the rotations.

DISEASE AND PESTS

Fungus and Bacteria

There is some incidence in Egypt of "sore-shin," the damping off of the young cotton plant caused by the Rhizoctonia fungus. It affects only young plants stunted by cold weather, however, and is not considered a really serious menace. Another species of fungus does some damage by penetrating weevil-infected bolls and blackening the lint. Otherwise, fungus and bacterial pests give little trouble. The Fusarium (wilt) fungus did a good deal of damage in the past, but the Ashmuni variety of cotton now almost exclusively grown above the delta has never shown any susceptibility to it, and immunity, or high resistance amounting to practical immunity, has been bred into all the long-staple varieties now grown.

The Leaf-Worm Scourge

Insect pests are another matter. Of these the leaf worm (Prodenia litura) is the most serious problem, particularly because it also feeds on corn and clover, which serve as the hosts on which its moth lays her eggs. With clover preceding cotton in the standard rotations and corn usually growing adjacent to it, at least on the small holdings leaf worm is difficult to combat. To add to the difficulty, some patches of clover must be held beyond the prescribed last cutting date for seed ripening.

So far as the small grower is concerned prevention plays little part in the fight against the menace. The first attack is by larvae that have hatched in the seed clover, but not until a new batch of moths has emerged from pupae in the clover roots and begun laying eggs directly on the cotton leaves (usually just before flowering begins) do the grower and the Cotton Inspectorate go into action. The law is that every egg must be removed and if the grower himself does not do the work, the local inspectors may have it done and charge him with the cost. The method still practiced even by many large growers and universally by the small grower is to pick the egg-laden leaves and burn them. The picking is done mainly by children, and is apt to be far from thorough.

Good results have been obtained by dusting with various insecticides, and the government farms and an increasing number of the large growers now keep the necessary equipment and dusting chemicals on hand, but even the simplest of dusting apparatus and the cost of the chemicals is beyond the small grower's means. Moreover, the incidence of the moth is apt to be sporadic. Only in the northern delta does it lay its eggs year after year

in numbers that would spell disaster unless they were largely destroyed. But when the invasion does strike in the upper delta and in Middle Egypt (there is little incidence above the Asyut Barrage), the damage is usually far more serious than in the northern delta, where leaf picking is, of necessity, a regular part of the cotton-growing routine. The small grower can hardly afford an outlay for equipment which will be used only occasionally, even if he wanted it.

The law respecting the destruction of eggs is strict. But leaf picking is seldom completely clean. The overworked, undernourished, apathetic cultivator resists the regulation, and complete enforcement is never possible. Only a few neglected fields are enough to start the cycle all over again, and by that time the new plantings of clover are ready to serve their function of over-winter hosts.

Boll Worms

Both the spring boll worm (*Earias insulana*) and the pink boll worm (*Platyedra gossypiella*) (not to be confused with the Mexican boll weevil [*Anthonomus grandis*] of the cotton fields of the United States) do extensive damage in Egypt; the pink boll worm is considered the greater menace. To make it possible to harvest the greater part of the bolls before the boll worm ravages reach their height, much effort has been expended in the development of early-maturing cotton varieties. Prevention is scarcely less difficult than in the case of the leaf worm. The larvae of the pink boll worm winter in the seed and in such of the bolls as are still green and unpicked when the grower, collects the cotton stalks to store for fuel before he prepares his land for the succeeding crop.

Treating the seed with heat is an effective counter measure. To ensure that there is time for heating all sowing seed before planting and that there is no unginned cotton left in the ginneries or storehouses from which infection may spread, the latest date for all ginning is set by law at April 15 in the delta and March 15 above the delta. Here again there is much evasion of the law. The Minister of Agriculture may grant an extension of the final ginning date if he considers it warranted by the circumstances, and this is all too frequently done. But even if there were no extensions of the final ginning date and all sowing seed were heat treated, there would still be the problem of the stored cotton stalks. If all bolls were picked before the stalks are collected or that all stalks stored for fuel were burned by the final ginning date, the problem would be solved, but enforcement of either would be extremely difficult. Perhaps the only way to get the full cooperation of the small grower would be for the government to buy all bolls still green at the final picking time. [7]

The spring boll worm, although much larger and much more voracious than the pink worm, is the lesser menace of the two. Its major winter host is okra (*Hibiscus esculentus*), a much-grown vegetable that is a winter crop only north of the delta. A secondary host is the cotton plants which sprout up from the roots. These are left in the ground in Upper Egypt when the stalks are collected, whereas in the delta the dry plant is pulled roots and all.

Experiments have demonstrated that dusting with insecticides could be effective with both types of boll worm, but only if it were repeated several times during the flowering and ripening period. So far as the small grower is concerned it would, consequently, have to be done by the government.

THE COTTON HARVEST

Cotton picking usually starts toward the end of July in the extreme south. By mid-August it is in progress throughout Middle and Upper Egypt. In the delta, it does not begin until early in September, except where early plantings may have been successful. The picking ends in October. In the basin irrigation sections of the Nile valley, where cotton is grown in parts of some basins by irrigating it with water lifted or pumped from wells or directly from the river, close work is sometimes required to get the cotton picked before the latest date to which the flooding of the basins can be postponed.

Children do most of the cotton picking, as they do the seeding. They work without bags, simply stuffing the cotton into the tops of their robes, where it is held by a cord around the waist. Dumping the pick is equally simple: the waist cord is untied and the picker steps out of the cotton that has dropped down around his feet. Leaves and stems are picked out and some damaged cotton is sorted out in the field, before it is packed into the jute sacks in which it is carried to the ginneries.

Larger estates generally pick at least twice. This may be done with one of two objectives or a combination of both: one is to pick only the perfect bolls in order to get top prices for the lint, while the other is an attempt to lessen boll worm damage by picking as much of the cotton as possible before the invasion reaches serious proportions. If the first of these is the objective, picking is delayed until practically all the bolls are opened, and then one gang picking the perfect bolls is followed by another picking what is left. If the latter is the objective, the field may be gone over two or three times to keep the bolls picked more or less as they open. Neither of these methods is followed to any extent by the small grower, who is inclined to wait until he can do all his picking in one operation, in spite of much urging by the Cotton Inspectorate. Because his margin of profit is small, he must depend mainly on his family for field work, and any such change would only add to his long and arduous labors.

The cotton-picking season is one of great activity. On the smaller plantings the grower's whole family is in the fields, the children picking and the elders stuffing the bags and collecting the stalks. For picking on the larger farms, children are recruited in the villages by the hundreds and carried away for the whole season, their wage a welcome contribution to the family income. The cotton is carried off from the fields to central assembly points, from which it goes to the ginning mills on camel back, truck, and sailboat, as well as by rail. The stalks are cut or pulled and immediately carried off to the farmers' houses for fuel. The many ginneries are running at full capacity. The larger grower, merchants, and traders are closely watching

the market prices, and there is much selling, buying, and speculation, and much business and industrial activity in other fields for which the cotton crop supplies the funds.

The small grower has been looking forward to the cotton harvest for many months, in the hope that his crop will be sufficient to pay off his loans for seed and fertilizer (and his rent, if he is a tenant) and purchase his small needs. It is practically the only time that he has any cash in hand. Whatever spending he may hope to do is postponed until then as are marriages and other festivities.

GINNING AND MARKETING

Until the present government took over the entire business of buying the cotton, the cotton grower had a number of avenues for the sale of his crop. Most growers sold their cotton unginned, although a large grower might on occasion hire his best pickings ginned and sell directly to an exporter or his local agent. The small grower usually sells his cotton in the field or at the village market. Before the new rule was passed, ginneries or merchants connected with them might be the buyers, but there were also large numbers of independent buyers who sold their purchases unginned to the ginneries or hired them ginned and sold them at the Spot Market in Alexandria or directly to an Alexandria exporter. Banks did some business as selling agents and a much larger business as indirect buyers. Banks play an important part in the cotton-growing process by advancing loans to the grower against his crops. Most of them have a special cotton department, and many of them maintained village warehouses in which the grower to whom a loan had been advanced was permitted to store his cotton if he thought that by holding it he might get a better price than he was offered at harvesting or ginning time. Then if the borrower was unable to repay the full amount of his loan the bank might have to take over the cotton and sell it on the market for what it would bring. It is reported that this has now all been changed and government agents buy all the cotton directly from the growers.

Ginning

Ginneries are numerous. There is one or more in most of the large towns, all privately owned except for one at the headquarters of the Ministry of Agriculture at Sakha. Roller gins are used, most of them of a primitive type in which the cotton is fed by hand between a leather-covered roller and a metal plate and pulled through by an oscillating blade which detaches the seed. Waste is removed with an equally primitive saw gin. The lint is pressed into large, loose bales at the ginnery and then baled tightly for export at Alexandria, with water, limited by agreement to no more than 8.5 per cent by weight, sprayed on in the baking process. It is argued by the cotton exporters against the objections of the foreign buyers that without this moistening it is possible to handle the otherwise excessively dry lint.

The Export Market

Except for a small amount of cotton grown in the northeast corner of the delta and exported from Port Sa'id, all of Egypt's cotton goes out by way of Alexandria. The well-organized and generally highly efficient marketing operations at Alexandria were carried on for many years by three separate organizations - an Exporters' Association, a Spot Market, and a Futures Market, with foreigners the major element in all three. The fifty-odd firms comprising the Exporters' Association were the final cotton buyers. Their buying was done largely at the Spot Market, but a number of them own one of or more ginneries themselves, and until the new regime reorganized the whole buying and selling operation; many others had agents who bought for them at the ginneries. The exporters are responsible for the rebaling for export, an operation which may include sorting and blending, in order to ensure uniformity in any particular lot, and if necessary hand picking to sort out damaged cotton. The actual baling is done, however, by a few separate companies that operate large steam presses.

Working with the exporters, but independent of them and under official supervision through a government chairman, is the Alexandria Testing House, whose function is to test all export cotton for moisture content. Shipping is done on order or on consignment, and all the large exporters have agents in the principal importing countries.

All of the exporting firms still have offices there at the Spot Market. In these offices the most important person is the grader, since it is he who passes on the quality of the cotton offered for sale to his firm. The hand of the government was felt here, even before the present buying regulations were instituted; the Cotton Office of the Ministry of Finance had a regular representative at the Spot Market with a staff of trained graders who served on the appeal boards set up to arbitrate disputes between seller and buyer.

The Futures Market operated much as do similar markets for cotton and other crops elsewhere, except for the difficulties arising from the large number of minor varieties offered for trade and the frequent offerings of new varieties during their period of untenderability. [8] Among the steps taken by the new regime to promote the development of local industries were measures to effect a reasonable stabilization of raw-cotton prices. It was felt that a major handicap to larger-scale development of cotton spinning and weaving was the instability and unpredictability of cotton prices at marketing time, and mainly to speculative manipulations in the Alexandria Futures Market. Consequently in November, 1952, the Futures Market was abolished and complete control of the cotton crop assigned to a Cotton Commission. This commission is to take over the entire crop at fixed prices and sell it to the exporters and the local mills in accordance with a price system based on New York prices and designed to afford a margin of profit to the grower which though small will be sure. The Futures Market has since been restored but under extremely restrictive regulations.

By-Products

Cottonseed meal is a rather important subsidiary product of the Egyptian cotton industry. In 1950 the yield was 5,852,000 ardebs (nearly 800,000 tons) and was valued at £E 5,919,000 (about $17,000,000). Since such heavy seeding is practiced in Egypt, about a fifth of the annual crop is inspected and certified for planting. Previous to World War II, a large part of the remainder was exported, but since 1942 it has all been processed in the local mills. Because of the great shortage of animal fats in Egypt, large quantities of cottonseed oil are used in food preparation. There is also a considerable production of oil cakes for stock feed.

OTHER FIBER CROPS

Flax

Flax (kittan) is a crop of great antiquity in Egypt. The weaving of linen was well advanced in Pharaonic times, as is evident from the fine quality of the cloth in which the mummies were wrapped. It is believed that the growing of flax and the spinning and weaving of linen were introduced into Europe from Egypt by the Romans (c. 30 B.C. to 300 A.D.). For centuries linen was one of Egypt's principal exports; it was not until cotton became the major export crop that flax was reduced to its present insignificant position. For many years previous to World War II the area planted to it averaged less than 10,000 feddans. During the war its cultivation was considerably expanded (it occupied 31,328 feddans in 1941), but by 1950 it had fallen to only about 5000 feddans.

The older varieties of Egyptian flax are of high quality and good yield, and the Ministry of Agriculture has recently succeeded in developing varieties of such superior quality as to attract the attention of flax growers elsewhere. The average yield of the old varieties of somewhat more than six qentars per feddan (600 pounds per acre) is exceeded only in parts of France and the Netherlands.

The production of linseed, an average of three ardebs per feddan of flax (783 pounds per acre) is correspondingly high. Linseed oil, for which the greater part of it is used, is an important supplement to the supply of cotton-seed oil for local use.

Flax is a winter crop planted in early November and harvested in February. It is grown mainly in the vicinity of Cairo, where the linen mills are located, in the provinces of Minufiya, Qalubiya, and Giza.

Jute

During World War II Egypt began to sow jute with the idea of decreasing or perhaps ultimately completely eliminating the country's dependence on India and Pakistan for the burlap used in cotton baling. The experiment was successful, but it is not practical to allot to jute growing the amount of land that would be necessary to supply the burlap requirements, not to mention the large amount of water required for irrigation and retting.

NOTES

1. C. H. Brown: Egyptian Cotton, London, 1953, pp. 8-9.

2. W. Lawrence Balls: The Cotton Plant in Egypt, London, 1912, p. 1.

3. M. P. S. Girard: Mémoire sur l'agriculture, l'industrie et le commerce de l'Égypte, in Description de l'Égypte ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française, publié par les ordres de Sa Majesté l'Empereur Napoléon le Grand, État Moderne, Vol. 2, Paris, 1813, pp. 542-544.

4. Brown, op. cit., p. 14.

5. W. T. Kroese: "The Past, Present and Future of the Cotton Industry (1904-1954)," in Mario Ludwig, ed., The Cotton Industry Today and Tomorrow, Manchester, 1955, p. 29.

6. Brown: op. cit., p. 50. 7. Ibid., pp. 46-47.

8. See C. R. Barber: The Alexandria Futures Market, The Alexandria Exporters' Association, publishers, 1951.

LAND OWNERSHIP AND TENURE

Private ownership of land in Egypt may be said to date from 1858, when the right of inheritance was affirmed by the government. Since the beginnings of recorded history, there had been periods when the ownership of all land was vested in the sovereign, whether by decree or armed seizure; periods in which the sovereign had granted large holdings to individuals or factions as rewards for services or as bribes for fealty; and periods in which powerful factions had seized large sections of the country. At no time before 1858, however, had any recognition been given to the rights of the peasant in the land he cultivated or, indeed, to any inherent right even to the crops he produced.

HISTORY OF OWNERSHIP AND TAXATION

Until the end of the eighteenth century, regardless of the form of government, agricultural labor on the large estates was mainly forced labor, with the recompense rarely more than a small plot of land assigned to the laborer for growing his food. There had also long been some tenantry on a share-crop basis. Outside the large estates, the land was occupied more or less in common, with a certain amount allotted to each village, and this allotment was either subdivided among the village families by the village chieftain or worked wholly or partly in common. Taxes were imposed upon the village as a whole, allocated among the village families by the chieftain, and collected by him. Taxes were thus essentially land rent paid to the sovereign. Theoretically, but not always in practice, the individual had the right to continue cultivating the land allotted to him or reclaimed by him as long as he paid his share of the village tax. He could not sell, mortgage, or lease his land allotment, and although his heirs on his death generally continued to occupy it, there was no legal confirmation of their right to do so.

The Mamelukes

Under Turkish rule, up to the accession of Mohammed Ali as governor-general in 1807, tax collecting came to be an hereditary privilege of the Mameluke beys and in the course of time they were given concessions of tax-free land with the right to draft agricultural labor from their tax districts. The Mamelukes were left much to their own devices, provided they returned each year the taxes levied against the villages in their districts. Naturally, therefore, they assumed the right to pass on these concessions to their heirs, along with their tax-collecting privileges, and thus establish their holdings, to all intents and purposes, as private properties. Gifts of land, tax-free and inheritable, were also made in the name of the Sultan to army officers, government officials, and others to whom the sovereign wished to show favor.

Another form of quasi-private property, the so-called wakf estates, was introduced with the Arab conquest (639-642 A.D.) when Egypt was added to the realm of Islam. As will be explained later, this was a system of mortmain by which Moslems, and Moslems only, could alienate real estate in perpetuity for religious purposes or family benefit.

Mohammed Ali, Titular Landlord

Many of the forms described above closely resembled private ownership. But the basic principle still held that final ownership of all land was vested in the government, and shortly after Mohammed Ali had been confirmed as Governor-General, he made himself the "sole titular landlord" of the country. By 1814 he had revoked the tax-collecting privileges of the Mameluk-es and confiscated their estates. But though he was contemptuous of tradition when it suited his purpose, he made no attempt to abolish the wakfs.

The Communal System Abolished

The movement toward private ownership for the peasants began in 1813 when Mohammed Ali had a general cadastral survey made of the land under cultivation and directed that such land be allotted directly to the cultivators instead of being held communally as previously. The holding assigned to each cultivator was to be registered in his name, and taxes were to be levied no longer on the village communities but directly on the individual holders.

This, of course, did not signify private ownership in any true sense; the holdings could not be sold or mortgaged and could be expropriated by the government without compensation. It was, however, a forward step. The cultivator found himself for the first time considered as an individual, rather than a mere faceless member of a village community. He was, moreover, recognized as the owner of the crops he produced, although Mohammed Ali, in his efforts completely to monopolize the commercially valuable products of his domain, decreed that the entire production of all such exportable crops as cotton, sugar cane, flax, indigo, vegetable oils, and even rice must be sold to his government at whatever prices it fixed.

Recognition of the Right to Mortgage and Sell

The breakup of Mohammed Ali's crop monopoly and landlordship was slow in coming. A commercial treaty, signed between Turkey and Great Britain in 1838 and made effective in Egypt in 1840, put an end to his monopoly by giving English merchants the right to buy agricultural and industrial products directly from the producers. By 1840 Mohammed Ali's landlordship was also being challenged; holdings were being transferred and loans made on crops. However illegal such transactions may have been, their necessity and inevitability were recognized. In 1846 they were legalized by a decree which permitted the sale of land holdings. But since such holdings could be expropriated without recompense and a man could be dispossessed of his land for failure to pay his annual tax, their status was still virtually that of leaseholds. However, a further step toward recognition of ownership rights was an accompanying provision for repossession by payment of the tax

arrears even after the lapse on a considerable number of years.

Determined to increase his revenues by expanding the land under cultivation, Mohammed Ali had retreated from his original opposition to private ownership and granted large tracts of uncultivated land, with full inheritance rights and tax free for ten years, to a number of men of means, both Egyptian and foreign. The only recompense he required was a guarantee that the land would be brought under cultivation, and when the question came up as to whether such properties might be sold, he reluctantly agreed to that also.

Inheritance and Other Private Rights

The right of inheritance by both male and female heirs in accordance with the Moslem law of succession was granted in 1858 under the Governor-Generalship of Ismail, son of Mohammed Ali's son Ibrahim. The last vestige still retained at that time of the traditional principle of final government ownership of all land was the right to expropriate without compensation; but its end was foreshadowed by a provision exempting from liability to expropriation land on which the holder had erected buildings, installed water lifts, or planted trees.

Periods in which Ismail, harassed by debts, rescinded certain of the rights of land ownership he had granted were followed by periods in which he restored them when the hoped-for results failed to materialize. The last obstructions to full ownership and inheritance rights were finally removed by a law promulgated in 1880 under the Khediveship of Tewfik, Ismail's son. By 1881 all land was in full private ownership except the Khedivial estates, land held by the wakf foundations, and land specifically held by the government. The wakf lands were still in a special category. While they were tax free, they could not be sold or leased, and only the right to their usufruct was inheritable.

Inequalities in tax assessments continued to limit the small cultivator's interest in securing land of his own in certain sections, and were only ironed out by a new cadastral survey and re-evaluation, conducted between 1892 and 1907.

The Movement to Small Ownership

Sure possession of his land, equality of taxation, and the right to sell his produce in a free market were inducements that the Egyptian peasant had never had before toward acquiring land of his own. Added attractions were the development of cotton growing; the assurance of equitable distribution of water for summer irrigation, as the irrigation system was progressively developed and its operation systematically organized; a government policy of selling off the khedivial estates in small holdings and of promoting the formation of land companies to reclaim uncultivated land also for sale in small holdings; and government provision of easy credit for land purchase.

The effect was dramatic. Between 1895 and the outbreak of World War I the number of owners of plots of five feddans or less almost doubled,[1] and the total area of holdings in this category increased by about forty per cent, although the total area under cultivation meanwhile increased by less than eight per cent. By 1950 the number of owners of plots of five feddans or less had again nearly doubled in number while the increase in the total area in holdings of all sizes was only a little over twelve per cent. In the latter period, however, the increase in the number of small holdings was due in considerable part to the usual practice of dividing up the property of a deceased parent among his children, in accordance with the Moslem law of succession. In 1913 the average size of holdings in this category was already very small - only a little over one feddan - and by 1950 it had fallen to eight-tenths of a feddan.

PRESENT PATTERNS OF OWNERSHIP

Ownership of cultivated land in Egypt in 1950 is shown by size categories in Table 1. There is some question, however, as to how closely

Table 1 - Land Ownership, 1950

	Lower Egypt		Upper Egypt		All Egypt	
Size in Feddans	Owners	Feddans	Owners	Feddans	Owners	Feddans
To 1	1,107,775	416,775	873,371	363,663	1,981,146	780,438
To 5	331,509	662,276	287,231	661,754	618,740	1,324,030
To 15	58,841	478,129	50,985	399,963	109,826	878,092
To 50	23,404	613,917	15,341	326,492	38,745	940,409
To 200	6,105	560,402	3,364	321,117	9,469	881,519
To 600	1,148	365,301	1,064	161,361	2,122	526,662
To 1000	172	125,377	62	55,726	234	181,103
To 2000	106	142,247	21	27,423	127	169,670
Over 2000	48	177,763	13	99,495	61	277,258
Totals	1,529,108	3,541,795	1,231,634	2,416,994	2,760,742	5,958,789

the table indicates the number of owners in the various categories and the total number. Although based on the lists of taxable properties, in which an owner of several separate holdings may have been registered a corresponding number of times, it is probably a fairly close approximation of the number of owners of properties of five feddans or less. In all events, the inequality of land distribution as indicated by the table is serious, and furthermore, it is a notorious fact that many single proprietors own two or more of the larger holdings that appear separately on the tax lists.

Besides individuals, land companies and associations own many large holdings. Organized for large-scale land reclamation, many of the land companies have added to the area of cultivated land. Their principal holdings are in northern and southern Beheira province and the northern parts of Fouadiya and Gharbiya in the delta, and in the Kom Ombo basin of Aswan province in the upper valley, since it is in these sections that most of the recent reclamation work has been done. Large holdings of individual owners are mainly in the delta provinces of Beheira, Fouadiya, Daqahliya, and Sharqiya in the Faiyum, and in the Kom Ombo basin. The Khedivial domain of Ismail was chiefly concentrated in Minya province; when broken up in 1907, this domain was sold off mostly in large holdings.

The Plight of the Small Owner

It may be determined from the table that although the 2, 599, 886 holdings of five feddans or less in 1950 constituted 94 per cent of all separate holdings registered, they occupied only 35 per cent of the land, and also that 76 per cent of them were in plots of no more than one feddan. On the other hand, holdings of more than 600 feddans, that is less than one half of one per cent of all the separate holdings registered, covered 34 per cent of the land and nearly ten per cent of that was in 422 holdings of more than 1000 feddans.

The great majority of the nearly 2,,000,000 small owners with only a feddan or less of land must eke out their living by leasing land from large landowners or hiring out as laborers. Owners of large holdings are almost exclusively city dwellers, who either rent out the whole of their land or rent part and farm the rest under the direction of resident managers. Owners of holdings of over five feddans almost always rent out their land or work it with hired labor.

Renters and Farm Laborers

The 1947 census of Egypt reported 681, 599 landless persons who rented land and 106, 964 landowners who also worked rented land, a total of nearly twenty per cent of those who gave their occupation as agriculture. No exact information is available on the area that is farmed under lease, but about 80 per cent of the land under cultivation is worked by the owners or under owner management and the remainder by tenants. The 1947 census listed 1, 391, 988 landless farm laborers.

The periods for which land is leased vary considerably. There are no leaseholds, as the term is generally understood in Europe - leases by which the tenant has security of tenure for a definite period of years or even bequeathable to his heirs for life. The common practice is to lease for one year only or, not infrequently, for a single crop period. Leases for more than three years are practically unknown.

Rent may be paid in cash or in produce (the latter particularly in the cotton-growing sections), and share cropping is common. With land so limited in proportion to the population, there are always more potential renters than there is land to be rented, hence the landlords can drive stiff bargains. So great is the need for land that overbidding on the part of prospective renters is common. Usually the rent, whether in cash or kind, is so high that it can be paid in full only if both the yield and the market price for the crop turn out to be high. If one or both fail to come up to expectations and the tenant is unable to pay the full rent, the difference between what he can pay and the agreed rent is usually accepted by the landlord as a debt against a future crop.[3]

Since the landlords generally try to push tenants to the limit of what they can pay, rents closely reflect the year-to-year fluctuations of the market (particularly of the cotton market). On the eve of World War II they ranged from £E 4 per feddan on new land to £E 10 on land in densely populated sections (about $18.00 to $46.00 at the current rate of exchange),[4] or an average of $26.00. With the rise in land values during and since the war, rentals have been running between £E 12 ($24.50) in the upper valley and £E 26 ($73.60) in the lower valley provinces and around Cairo.[5]

When the rent is paid in crops, the amount is based on their value at harvesting time. The share of the share cropper depends on the crop grown and on how much the landlord contributes to its making. The maximum share is about one half, if the share cropper supplies all the seed and fertilizer, furnishes his own draft animals, does all the work, and pays the taxes. But since the landlord more often than not has to meet a considerable part of the expense of getting the crop started, the share cropper may end the season with less profit than if he had put in his time as a day laborer.

Many progressive large landowners reserve for cultivation under their own or managerial direction the land they allot to cotton, and rent out the remainder. In such cases the tenant commonly gives the landlord a certain number of days of work in lieu of part or the whole of his rental.

Whatever the rental form, the landlord or his manager keeps a constant watch on the tenant, regulating his supply of irrigation water, directing the rotation of his crops, and finally storing the harvest as surety against the payment of his rent.[6]

Farm Labor Wages

Wages of male agricultural day laborers for a twelve-hour day average between 10 and 15 piastres (28.7 to 43.05 U. S. cents at the current rate of exchange), but may rise to 25 piastres (61.75 cents) in sections where labor is scarce, as in the northern part of the Nile delta.[7] Since the day laborer averages between ten and fifteen days of work per month, his yearly wage amounts at best to no more than £E 27 (about $78.00). It is common practice, however, for the women and children of the laborer's family to work when the demand for labor is particularly heavy, as in planting and hoeing cotton and picking the pest-infested leaves and harvesting the crop. Women's wages are usually about half those of men. Children are paid between 6 and 7 piastres (17 to 20 cents) for cotton picking.

Overseers, foremen, and clerks on the larger estates are usually year-round employees and are commonly compensated in part with the use of a small piece of land.

Farm Credit and Cooperatives

One might expect that Egypt would be fertile ground for the growth of cooperatives for credit, marketing, and retail buying. It might also be expected that Egyptian peasants would have become traditionally cooperative minded from living together through the millennia when basin irrigation predominated and homesteads had to be built close to one another on hillocks raised above the flood-water level by cooperative effort; they have shared the village lands, have worked them together, built and maintained the dikes, kept the canals open, and regulated the flow of flood water. Despite all this, their constant struggle for existence has made them extremely individualistic. Furthermore, as perennial irrigation developed and government took over the management of the whole system, an important demonstration of the value of cooperation was removed. Finally, although the peasant is still inclined to have his permanent residence in a village, now that he no longer shares the village land in common he has adopted the practice of moving family and livestock to temporary quarters on his plot of land during the crop season, which further weakens his traditional communal ties.

A few agricultural cooperatives were founded early in the present century, but the movement received no government support until after independence (1922). Government supervision of cooperatives was established by laws passed in 1923 and 1927. The law of 1927 placed with the Banque Misr a credit of £E 350,000 (about $1,650,000 at the current rate of exchange) for loans to cooperatives. (The Banque Misr, so-called from the modern Arabic name for Egypt, was founded in 1920 chiefly to promote industrial development.) Accredited cooperatives were empowered to borrow from this fund at four per cent and loan to their members at seven. With this inducement, credit cooperatives developed rapidly; by 1931 there were 539, with a membership of 53,000.

In 1931, however, small farmer cooperative operations began to decline. The Banque du Crédit Agricole was founded that year for the express purpose of making loans to both cooperatives and individuals, but since the interest rates were lower to the former than to the latter, large landowners joined the cooperatives and soon controlled many of them. An Agricultural Bank, founded in 1902, advanced short-term loans directly to the small farmers until 1912, when the so-called Five Feddans Law was passed. This law protects the owner of five feddans of land or less from having his land, house, or tools sold for debt, but although this protection was much needed, it deprived the bank of a large measure of security for its loans. The Banque du Credit Agricole was exempted from the Five Feddans Law and in consequence has been little used by the small farmers.

The cooperatives had their greatest development during World War II, mainly as the result of their use by the government for distributing supplies. They were reorganized and placed under government control in 1944, and the Banque du Crédit Agricole became the Banque du Crédit Agricole et Coopératif in 1949. The cooperatives are still mainly credit associations, and have served a good purpose in helping the Egyptian peasant free himself from the professional money lender. They have contributed little, if anything, however, toward improving his living conditions.

AGRARIAN REFORM

After the military coup d'état of July 23, 1952, and the enactment of a land reform law in September of that year, the land tenure situation changed radically. Some division of the large estates to provide more land for small cultivators had long been urged by various progressive leaders, and a number of bills to that end were introduced in Parliament in the year immediately preceding the abolition of the monarchy, only to be defeated by the landlord majority of its members. The new regime speedily and forthrightly attacked this most serious of Egypt's problems.

These new leaders by no means expected the land reforms to solve the problem of providing sufficient land for Egypt's densely settled and rapidly growing rural population. Nor was there any intention of transforming the whole of the Nile valley and delta into a country of small holdings. The object was merely to afford a certain measure of relief by eliminating some of the worst inequalities of land ownership, and to release for investment in industry some of the money tied up in large real estate holdings.

The Need for Reform

Of Egypt's total population (enumerated as 19, 321, 840 in the 1947 census and estimated as 24 million in 1958), about 70 per cent is rural. If the area of 5, 958, 789 feddans registered for tax purposes in 1947 were divided equally among the 2, 760, 742 registered as owners, it would have provided only about 2.2 feddans per family, or .44 of a feddan per capita of the estimated 13, 255, 000 rural population. However, for Egypt a distinction must be made between the cultivated area and the "total" crop

area, which is the sum of the areas planted to winter, summer, and autumn crops where perennial irrigation is provided (see Chapter 4, Agriculture). In 1950 perennial irrigation increased the total crop area to 9,322,500 feddans, making the average crop area per landowner 3.3 feddans and the average per capita of the rural population .7 of a feddan. Hence, considering the generally high yield to be obtained from the Nile soils and the ability of the Egyptian peasant to get the most out of the land, an equal division of the cultivable land would probably provide the agricultural population with the means of attaining a standard of living better than the present average.

The Agrarian Reform Law of 1952

The new regime, however, envisages no such drastic step. The land-reform law is only one of a number of measures proposed to put more land under cultivation and into the hands of more people, and these measures are all a part of a many-faceted scheme for economic development. The money paid to the large owners for the land taken from them will be invested in industry. This consideration is probably scarcely less important in the minds of the new economic planners than the provision of more land for the land-hungry small cultivator. One of the most serious obstacles to the development of industry in Egypt has been the traditional practice of the moneyed class to invest its funds in land rather than in industry.

The law of 1952 must have been the result of much study and planning.[8] Agricultural holdings under cultivation or in condition for cultivation at the time the law was passed were to be limited to 200 feddans each. New land in the process of reclamation was exempted from this restriction for 25 years, because such reclamation cannot be efficiently carried out without considerable capital investment. Also exempt were the holdings of land companies in process of improvement for sale and land which, before the enactment of the law, had been held for industrial development. An owner of more than 200 feddans was permitted to transfer to each one of his sons 50 feddans, up to a total of 100 feddans. The surplus was to be expropriated by the government, subdivided, and sold in plots of not less than two or more than five feddans, the amount of land allotted to a purchaser depending on the size of his family and the amount of land he already owned if he were an owner. If the land requisitioned was being worked by tenants they were given the prior right to purchase.

Indemnity for expropriated land was to be paid with three per cent government bonds redeemable in thirty years and was fixed at ten times the rental value of the land, plus the value of any buildings and machinery that have been installed and trees planted on it. The rental value was fixed at seven times the amount of the tax assessment. The price to the purchaser was to be figured by adding to the amount of the indemnity fifteen per cent for handling expenses, with interest at three per cent, and the total was to be paid off in thirty years.

The law called for completion of the entire expropriation operation in five years and the expropriation of not less than one fifth of the total in any one year. It was estimated at the time the law was passed that 1572

owners would be dispossessed of land in excess of 200 feddans, although the total number of holdings of that size in the 1950 tax list was 2594 (see Table 1), and that the total expropriation would amount to 621,479 feddans, 9 or nearly 77 per cent of the total in holdings of over 200 feddans and about 14 per cent of all land registered for tax purposes in 1950. It was also estimated, that the land would go to about 200,000 families.

According to investigations carried out by the Ministry of Social Affairs, seven is the average number of persons in the farm families eligible as purchasers under the Land Reform Law. To afford a measure of assurance that all families purchasing the expropriated land would acquire enough to enable them to earn a fair living, special provisions were made for families larger than the average.

In cases where the land expropriated included orchards, or gardens, or both, these were to be distributed only to graduates of agricultural institutions, in allotments of no more than twenty feddans each.

The new law also directs that the farmers in any village who have purchased expropriated land and whose total holdings do not amount to more than five feddans each must form an agricultural cooperative. Until these cooperatives can stand on their own feet, they are under official supervision by agricultural school graduates experienced in social work, appointed by the Ministry of Social Affairs. These cooperatives advance loans for crop production; they supply seeds, fertilizers, and equipment and provide crop storage and transportation; they promote collaboration in crop planning and cultivation, seed selection, care of the land, sale of crops, and payment of financial obligations; and they provide social services.

To handle the land allotments and to manage the expropriated land so that production would not decline before the final distribution was made, a High Committee for Agrarian Reform was set up, with regional farm managers, assisted by staffs drawn from among the managers, overseers, and clerks previously employed on the expropriated holdings. Pending final allotment, the expropriated land would be worked in part by hired laborers and in part under lease. By the autumn of 1953, 181,000 feddans were in the hands of the committee, and distribution began the following summer.[10]

Late in 1955, it was officially reported that 656,139 feddans had been marked for expropriation, 415,000 feddans had actually been expropriated, and 261,000 feddans had been distributed.[11] Complaints were heard, however, that landlords whose land had been taken the previous year had not received the thirty-year, three per cent bonds in payment, and that there was so much mismanagement by the new owners that many of them had been unable to meet their annual purchase or even tax payments.[12] By the end of 1957 about 550,000 feddans - 175,000 of them confiscated from the royal family - had been taken over and distributed to some 250,000 peasant families.[13]

The law also affords relief to tenants. It prohibits the rather common practice of renting through agents by providing that land can be only rented to those who are to farm it. The landlords' old, widely followed, and generally pernicious practice of waiting until the crop is harvested before setting the rental price is abolished. The rental price must be stated in all written leases. The term of unwritten leases is three years and the rent is on a crop-sharing basis, with the owner taking half the crop after all expenses have been paid.

No provision is made for land purchase by the landless farm laborers; but the law provides for the fixing of minimum wages by order of the Ministry of Agriculture and also gives the laborers the right to form labor unions.

ABOLITION OF THE WAKFS

Certain other measures enacted in connection in connection with the Land Reform Law should provide still more land for small farmers. These are the abolition of what is known as national or family wakfs and provisions for relieving the religious wakfs of agricultural land as are at present yielding them little or no profit.

The wakf (the word means to halt or bring to a stand-still) is an institution that was at one time common throughout the Moslem world. The Arab conquerors adopted it from their Byzantine predecessors, who had used it to support churches and monasteries, schools and colleges, and charitable institutions. It is a form of landholding, both rural and urban, whereby real estate can be purchased, or otherwise acquired, and established in perpetual and inalienable tenure, with only the right to the revenue (its usufruct) disposable and bequeathable.

As originally conceived, these wakfs were endowments invested in real estate (rural and urban) to provide revenue in perpetuity for religious, educational, and charitable purposes, on behalf of the Moslem population - that is, they were all what are now known as religious wakfs, or khairi. But the law was early interpreted as permitting the establishment of endowments for the support of needy relatives of the endowers - also in perpetuity - and the endowers themselves and their heirs soon became the beneficiaries. These family wakfs (ahli) were given a religious flavor by the stipulation that, if there were no legitimate beneficiaries, they would thenceforth be administered as religious wakfs. Until 1835, when Mohammed Ali founded an Administration of Wakfs in his government, all wakfs were set up in the form of bequests to the caliph (only Moslems were permitted to establish these endowments), so that they would be administered by the caliph's local ecclesiastical court. [14]

Although they are now burdened with unprofitable rural holdings and much badly run-down city property, the religious wakfs have in general been fairly well administered, and have done good service, particularly in the support of schools, colleges, and charitable institutions. But the disadvantages soon outweighed the advantages of most family wakfs.

Since the beneficiaries inherit only the revenues from the land, mismanagement and deterioration increased from generation to generation. Until Mohammed Ali created his Administration of Wakfs, official oversight of these wakfs was in the hands of agents appointed by the ecclesiastical authorities, but these agents were not required to give an accounting of their stewardships. The office soon came to be self-perpetuating and even hereditary. The result was widespread corruption on the part of the agents and a serious decline in the productivity of many of the wakf holdings.

Early in the seventeenth century an attempt was made to remedy the situation by granting hereditary lease rights to wakf land. This improved the care of the leased land and restored some of its productiveness, but even so, in most cases, it was the agent rather than the beneficiaries who profited. Opportunities for mismanagement and corruption did not diminish after the government took over administration of the wakfs. Even where administrators were honest and they and the beneficiaries were personally concerned with maintaining the productiveness of the land, they were frustrated because they could not obtain funds for improvements by mortgaging or selling land, and were rarely able to borrow even the funds for carrying a crop, since they could offer banks only the revenue, and not the land itself, as security.

This lack of security for loans also made it difficult to lease wakf land. For carrying their crops and improving the land tenants could borrow only such funds as the banks were willing to advance against the anticipated crops, and rarely could they look to the wakf beneficiaries for any assistance. Hence much of the land went unleased.

Table 2 - Wakf Land, 1950

	Lower Egypt		Upper Egypt		All Egypt	
Size in feddans	Holdings	Feddans	Holdings	Feddans	Holdings	Feddans
To 1	964	592	7, 140	5, 198	8, 104	5,790
To 5	1, 768	3, 827	8,722	31,973	10,490	35, 800
To 50	2, 886	43,688	3, 629	58, 155	6,515	101,843
To 200	762	75,847	759	70,438	1,521	146,285
To 600	253	81,924	192	51,938	445	133,862
To 1000	52	39,873	25	17,635	77	57,508
To 2000	18	23,375	9	11,564	27	34,939
Over 2000	17	62, 508	3	6,834	20	69,342
Totals	6, 720	331,644	20,479	253,735	27, 199	585,369

Wakf holdings registered in 1950 are shown by size categories in Table 2.[15] Of these holdings only about 93,000 feddans were in religious wakfs.[16] The Land Reform Law provided that all family wakfs were to be sold under the same stipulations as were applied to expropriated land, the returns to be invested in economic development and rehabilitation projects. Of the land in family wakfs, 110,000 feddans were already in the hands of the Ministry of Wakfs when the law was enacted. These were to be sold off in small plots, as were other family wakfs after the beneficiaries had received the proportions allotted to them by the law.

Criticism of the Reform Law

One widely voiced criticism of the Land Reform Law was that the large landowners may still retain too much land to admit of any really substantial relief to the impoverished Egyptian peasant. But the law is a revolutionary one even as now formulated. Its execution would go far to break the power of the landlords, who were the chief support of the old order. Meanwhile, it is important for the new regime to keep the support of the large group of owners of middle-sized holdings. This might well have been lost had the maximum holding been reduced to fifty feddans, as critics of the law have advocated.

Fear was also expressed that transforming so much land into small holdings would result in a substantial decrease in agricultural production. In Egypt, however, the smaller the farm, the greater the production per unit area tends to be. The advantage of large-scale, mechanized farming is not in greater yields per unit area than on small lots worked by hand labor and draft animals, but greater yields per hour of man labor involved. It need scarcely be argued that owners are normally more concerned with maintaining their land in good production than renters are. Further fragmentation of the plots of land to be sold is prohibited by a clause in the Land Reform Law which forbids inheritance of them by more than one heir.

There was also some fear purchasers might be inclined to raise on expropriated land more food crops for their own consumption than the land had previously carried, with a corresponding decrease in land planted to commercial crops. However, the Irrigation Department exercises great influence over the whole program of farm operations, and can if necessary control it.

A landowner might forestall expropriation by disposing of his excess land directly by sale, but he was permitted to sell it only to owners of ten feddans or less, and only in plots of not more than five feddans to any one purchaser. It seemed likely that many would nevertheless try to sell their land, because the direct-scale price would probably be higher than the expropriation compensation, and also because all excess land was taxed at five times the regular rate until its expropriation was completed. (By the end of 1955, 92,000 feddans had been disposed of by direct sale.)

Persons attempting to sabotage or obstruct the execution of the Land Reform Law were subject to trial by court martial and severe punishment. The only attempted opposition by force so far reported was immediately halted, and its leaders were summarily tried and sentenced to life imprisonment.[17]

All things considered, while only a small minority of farmers received expropriated lands, they have not been the only ones to gain; increases in wages and security have aided an estimated four million agricultural workers. As one authority puts it, "This improvement in income and legal status for a very large section of the farm population is by far the most valuable achievement of the reform, greatly exceeding in importance the benefits of redistribution."[18]

A NEW PROVINCE

Among the projects undertaken by the new regime to add to the cultivable land available for small holdings is the creation of a new province known as Tahreer (Liberation). It will border the delta provinces on the west; its area will be 600,000 feddans at the outset and, eventually, double that size. A thirteen kilometer canal taking off from the Beheira Canal has been constructed to provide water for irrigation during the Nile flood. During the low-water period irrigation water will be pumped from what is believed to be an abundant subterranean water supply. In November, 1955, before the canal had been completed, it was reported that a considerable area was already in crops.[19]

Besides providing additional farmland, the new province is designed to serve as a model for rehabilitation elsewhere. There are two model villages, each consisting of 230 houses of hollow brick construction, with two rooms and a kitchen, bathroom, and storeroom, and with water and electricity installations. Other accommodations in these first villages are a livestock shed, a bakery, a pumping station to supply subterranean water for household use, a milking barn with mechanical milkers and a pasturing machine, poultry houses equipped with incubators, a mosque, a school and playground, and a care center with assembly hall.

An average of 1500 feddans for agricultural settlement is assigned to each village. The new settlers include ex-service men with farming experience (sixty per cent); graduates of industrial, agricultural, and commercial intermediate schools (twenty per cent); university graduates (ten per cent); and others (ten per cent). The land is distributed in holdings of five feddans per family, except that university graduates receive ten feddans.[20]

In March, 1957, the Egyptian government announced a ten-year plan for reclaiming 1,200,000 acres southwest of Alexandria, by means of water to be canalled from the Rosetta Branch of the Nile.[21]

NOTES

1. A. E. Crouchley: The Economic Development of Modern Egypt, London and New York, 1938, pp. 162-163.

2. Annuaire Statistique, 1949-1950 et 1950-1951, Département de la Statistique et du Recensement, Min. des Finances et de L'Écon., Cairo,1953, Table 3, pp. 354-359.

3. C. H. Brown: Egyptian Cotton, London, 1953, p. 12.

4. Doreen Warriner: Land and Poverty in the Middle East, Royal Institute of International Affairs, London, 1948, p. 36.

5. Charles Issawi: Egypt at Mid-Century: An Economic Survey, London and New York, 1954, p. 130.

6. _Ibid._, p. 128.

7. _Ibid._, p. 39.

8. See Sayed Marii: The Agrarian Reform in Egypt, _International Labour Review,_ Vol. 59, No. 2, February, 1954, pp. 140-150.

9. From an undated pamphlet by Dr. Abd-El-Razzar Sidky, Minister of Agriculture.

10. Issawi, _op. cit._, p. 136.

11. Information Administration: The Egyptian Government in Three Years, Cairo, (1955), p. 20.

12. New York _Times_, October 23, 1955.

13. Stella Margold: "Agrarian Land Reform in Egypt," _American Journal of Sociology and Economics_ Vol. 17, No. 1, October, 1957, p. 8.

14. The Administration was elevated to a Ministry by the Khedive Ismail, re-established as an Administration with a Director-General directly responsible to the Khedive in 1885, and raised again to the rank of Ministry in 1913.

15. _Annuaire Statistique_, _op. cit._, pp. 354-359.

16. Issawi, _op. cit._, pp. 131-132.

17. Doreen Warriner: Land Reform in Egypt and Its Repercussions, _International Affairs_, Vol. 29, No. 1, 1953, p. 3.

18. Doreen Warriner: Land Reform and Development in the Middle East, London and New York, 1957, p. 39.

19. Martin Flavin: Egypt's Liberation Province, The Beginning of a Beginning, The Reporter, Vol. 13, No. 7, November 3, 1955, pp. 23-29. Also see Doreen Warriner: Land Reform and Development in the Middle East, op. cit., pp. 49-53.

20. From a pamphlet entitled "The Liberation 'Tahreer' Province," published by the committee for Economic Development of the Egyptian government, undated but received by the American Geographical Society early in 1956.

21. Margold, op. cit., p. 16.

8. RAW MATERIALS AND MINING

Relics of the past, the examination of ancient mines and quarries, and the limited amount of detailed mineralogical surveying and prospecting that has been done make it seem clear enough that Egypt has a wide variety of minerals, particularly in the Eastern Desert and Sinai. Much more surveying and prospecting must be done, however, before any definite idea can be had of the country's mineral wealth available for profitable exploitation. Petroleum, manganese, phosphate, natron (natural soda), and talc are the only minerals at all extensively exploited at present, and iron ore is the only additional mineral known to occur in sufficient amounts to offer prospects of making a significant contribution to the country's economy.

MINERAL WORKINGS, PAST AND PRESENT

The Eastern Desert and Sinai were the scene of much mining and quarrying from early Pharaonic times until well toward the end of the period of Roman rule. Deserted mines and quarries and ruins of settlement in what is now wilderness, and traces of roads to them across the desert testify to extensive and intensive exploitation, as do also the pyramids and temples and the work of sculptors and painters, jewelers and engravers, found in them.

Until the Roman occupation interest was centered on the mining of precious metals (chiefly gold) and of precious and semiprecious stones and the quarrying of fine building and monumental stone for local use. The Romans, concerned with production for trade, penetrated much farther and much more widely into the desert than did their predecessors; posts and settlements were established throughout the Eastern Desert and along the Red Sea and the Gulf of Suez, and a network of roads connected them with coastal ports and the Nile valley and delta.

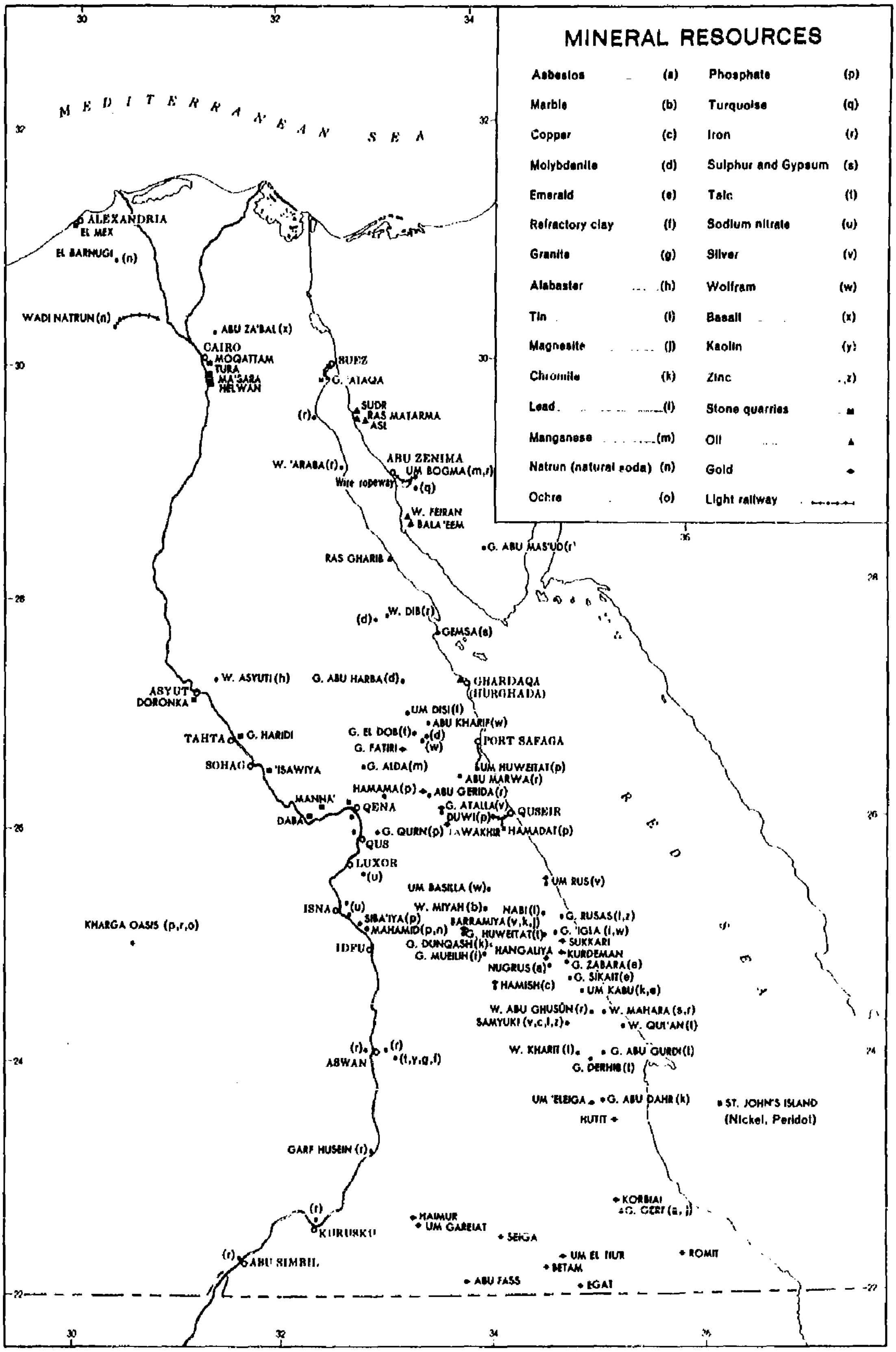
That the mining of metals and gem and semiprecious stones was still carried on under the Romans is evident from the remains of numerous mines, as for example, the copper mines at Um Bogma in Sinai and the turquoise mines at Sarabit el Khadim in the western part of the peninsula. More impressive relics of their activities, however, are their quarries in ornamental stones, such as those in the red porphyry at Gebel Dukhan and at a great post still called Mons Claudianus in the guidebooks, with its fortress and temples cut out of a granite mass south of the high ranges of Shayeb. From the end of the Roman period down to the opening years of the present century there was little mining or quarrying and little interest on the part of government or private capital in either. In fact, present-day interest in the mineral resources of the country dates from 1905 when the government drafted plans to attempt the revival of the gold-mining industry and created a Department of Mines for the purpose. Lack of funds, owing to the financial crisis of 1907, put an end to this attempt, and the Department of Mines was reduced to a section in the Survey Department, which had been organized in 1898. Interest in the potentialities

of the long-neglected mineral resources of the deserts as a source of revenue for the government was revived, however, by a series of discoveries made shortly thereafter. In 1908 important deposits of phosphate of lime were discovered on the Red Sea coast, and 1910 witnessed both the opening of the first petroleum well on the Gulf of Suez coast and the finding of manganese in western Sinai.[1] These discoveries emphasized the need for topographical and geological surveying of all the desert areas of the country, but the work was not undertaken in earnest until 1920 when a Desert Survey was organized in the Survey Department.

Many of the mineral occurrences that have been examined so far appear to be so small or so thoroughly worked out as to preclude the possibility of profitable exploitation. Although many others seem to be large enough to warrant exploitation, their working has been hampered or postponed by lack of capital (due particularly to the reluctance of Egyptians to invest in their own country in anything but land) and also because the metallurgical industries in the country are too small to provide local outlets for any substantial amounts of raw material. The high costs of providing a water supply and other necessities for mining communities and especially the cost of transporting the product to railhead or seaport are also obstacles to the development of many of the known sites. Even where deposits are relatively close to the sea as, for example, those near the Red Sea and Gulf of Suez coasts, transportation is apt to be a serious problem, since there are not many harbors suitable for ore loading. The few settlements of miners and petroleum workers are mostly along the Red Sea coast, and the total number of persons engaged in petroleum extraction and in mining and quarrying is only a few thousands (about 7000 were reported in 1951).

Nevertheless, a considerable variety of minerals are worked, as is shown in Table 1, although many of these are worked either sporadically or on a very small scale. The annual production of petroleum, phosphate, and manganese only is at all sizable. Most of the metallic ore is exported - a total in 1953 of 247, 087 tons, valued at £E 967, 806 (about $2, 778, 570). Of this by far the greater part was manganese (212, 788 tons) and the remainder small amounts of iron, lead, zinc, chromium, and tungsten ore and various base metal ores. More than 50 per cent of the phosphate mined is also exported - 379,115 tons, valued at £E 1, 057, 330 (about $3, 035, 590) in 1953.

The present government of Egypt is greatly concerned with promoting the prospecting for and exploitation of mineral deposits. To this end it began at once to ease the investment restrictions that had previously operated substantially to discourage foreign companies and has allocated a special fund for aerial and geological surveying and mineral research. A mineral research center was established in 1954 at Mersa 'Alam on the Red Sea coast, about 130 kilometers south of Quseir.[2] What effect the present nationalization of the country's basic resources will have remains to be seen.



MINERAL RESOURCES
Asbestos (a)
Marble (b)
Copper (c)
Molybdenite (d)
Emerald (e)
Refractory clay (f)
Granite (g)
Alabaster (h)
Tin (i)
Magnesite (j)
Chromite (k)
Lead (l)
Manganese (m)
Natrun (natural soda) (n)
Ochre (o)
Phosphate (p)
Turquoise (q)
Iron (r)
Sulphur and Gypsum (s)
Talc (t)
Sodium nitrate (u)
Silver (v)
Wolfram (w)
Basalt (x)
Kaolin (y)
Zinc (z)
Stone quarries
Oil
Gold
Light railway
MEDITERRANEAN SEA
ALEXANDRIA
EL MEX
EL BARNUGI (n)
WADI NATRUN (n)
ABU ZA'BAL (x)
CAIRO
MOQATTAM
TURA
MA'SARA
HELWAN
SUEZ
G. 'ATAQA
SUDR
RAS MATARMA
ASL
(r)
W. 'ARABA (r)
ABU ZENIMA
UM BOGMA (m, r)
Wire ropeway
(q)
W. FEIRAN
BALA 'EEM
G. ABU MAS'UD (r)
RAS GHARIB
(d)
W. DIB (r)
GEMSA (s)
W. ASYUTI (h)
G. ABU HARBA (d)
GHARDAQA (HURGHADA)
ASYUT
DORONKA
UM DISI (l)
ABU KHARIF (w)
G. EL DOB (l)
(d)
(w)
G. FATIRI
TAHTA
G. HARIDI
PORT SAFAGA
SOHAG
'ISAWIYA
G. AIDA (m)
UM HUWEITAT (p)
ABU MARWA (r)
HAMAMA (p)
ABU GERIDA (r)
MANNA'
QENA
G. ATALLA (v)
DUWI (p)
QUSEIR
DABA
G. QURN (p)
HAMADAT (p)
QUS
LUXOR
(u)
UM BASILLA (w)
UM RUS (v)
ISNA
(u)
W. MIYAH (b)
NABI (l)
G. RUSAS (l, z)
SIBA'IYA (p)
BARRAMIYA (v, k, j)
MAHAMID (p, n)
G. HUWEITAT (t)
G. 'IGLA (l, w)
SUKKARI
KHARGA OASIS (p, r, o)
IDFU
G. DUNQASH (k)
G. MUEILIH (i)
HANGALIYA
KURDEMAN
NUGRUS (e)
G. ZABARA (e)
G. SIKAIT (e)
HAMISH (c)
UM KABU (k, e)
W. ABU GHUSŪN (r)
W. MAHARA (s, r)
SAMYUKI (v, c, l, z)
W. QUI'AN (l)
(r)
(r)
ASWAN
(t, y, g, f)
W. KHARIT (l)
G. ABU GURDI (l)
G. DERHIB (l)
UM 'ELEIGA
G. ABU DAHR (k)
HUTIT
ST. JOHN'S ISLAND (Nickel, Peridot)
GARF HUSEIN (r)
KORBIAI
G. GERF (a, j)
(r)
KURUSKU
HAIMUR
UM GAREIAT
SEIGA
(r)
ABU SIMBIL
UM EL TIUR
BETAM
ROMIT
ABU FASS
EGAT
30
32
34
36

Table 1 - Mineral Production (in metric tons)

	1939	1942	1945	1948	1951
Petroleum	666,419	1,181,810	1,349,473	1,890,595	2,332,176
Phosphate	547,537	328,440	349,374	377,005	500,866
Manganese	119,882	8,169	47	59,919	155,364
Sodium carbonate and sulphate	3,750	6,500	6,700	4,000	7,750
Talc	833	1,875	3,868	5,521	3,757
Diatomite	---	1,254	975	1,365	1,752
Wolfram	2,021	3,346	---	15	1,422
Asbestos	---	---	85	1,625	1,247
Ochre & iron oxide	719	6,732	4,056	2,196	836
Magnetite		56	6	389	857
Ilmenite		665	46	1,601	326
Zircon	5,208	39	10	94	3
Monazite		---	---	6	1
Lead	---	14	---	---	529
Calcium carbonate	109	18	105	630	500
Kaolin	---	355	512	171	240
Barite	31	60	54	---	41
Pumice stone	1,650	254	950	800	41
Magnesium sulphate	---	710	610	---	---
Aluminum sulphate	---	700	140	---	---
Felspar	74	19	64	---	---
Copper	---	120	---	---	---
Sulphur	---	130	290	---	---
Chrome	---	---	150	191	---
Magnesite	---	---	50	---	---
Molybdenum	---	1	---	---	---
Pure tin (kilograms)	---	2	14	---	7
Gold (kilograms)	120.6	55.0	93.7	119.8	474.4

Compiled from the Annuaire Statistique published by the Statistical Department of the Ministry of Finance, Cairo, 1952.

PETROLEUM

Since there are no deposits of coal in Egypt, so far as is known at present, and hydroelectrical power is still but little developed, petroleum is the primary indigenous source of heat and energy as well as being a major item of import. The country now depends on it for 90 per cent of the power used. Exploration for petroleum is being vigorously pushed in many sections, and the known sources are being fully exploited. In recent years, however, as local industry has developed, the demand has continuously far outrun production, as shown in Table 2,[3] so that the output today furnishes no more than two-thirds the local consumption.

Of petroleum products locally refined, only asphaltic bitumen and bottled gas are produced in sufficient quantity to satisfy the local demand. Of the products consumed, two-thirds is fuel oil, twenty per cent kerosene, and nearly ten per cent gasoline. The rapid increase in consumption during the last twenty years results from industrial development, conversion of

Table 2 - Production and Consumption of Petroleum Products

Year	Production in thousand tons	Consumption in thousand tons	Production in percentage of consumption	Imports in £E millions
1930	269	449	60	0.5
1935	161	484	33	0.8
1940	870	1124	77	2.6
1945	1241	2386	52	10.8
1950	2191	2908	75	9.8
1951	2156	3115	69	13.1
1952	2204	3115	70	14.3
1953	2183	3232	67	14.5

railroad locomotives from coal to oil (the Egyptian State Railways alone consume more than 500,000 tons of fuel oil a year), the increasing use of motor cars and tractors, and the use of diesel engines for irrigation and drainage (pumping water, manipulating dam and barrage sluice gates).

The Early Fields

The Gemsa Field.

Petroleum was known to the ancient Egyptians, who obtained it from seepages and from impregnated rocks for use in the mummification process. Long afterwards, the Romans found traces of it at Gebel Zeit on the Gulf of Suez coast. Its modern discovery dates from 1885, when it was found seeping into sulphur pits and caves in the course of sulphur-mining operations on the Cape of Gemsa, a few miles south of Gebel Zeit.

Drilling did not get under way until 1908, when the concession for working the Gemsa field was granted to what was known as the United Oil Company of Egypt. Two years later the Anglo-Egyptian Oilfields Company, to which United Oil had turned over its concession, tapped the Gemsa field. Anglo-Egyptian, an affiliate of British Shell, is the oldest prospecting and operating company in the country and is still the principal concern engaged in extracting petroleum and refining petroleum products. All of the properties were sequestered by the Egyptian government after the British-French attack following the Israeli invasion of Sinai in October, 1956.[4] When its properties were sequestered, Anglo-Egyptian held concessions for the major producing fields, and its refinery at Suez, first opened in 1913 and since expanded several times, was the only privately owned refinery in the country. A government refinery of much smaller capacity was put into operation near it in 1919. The Gemsa field was short lived. Its maximum annual output of 91,800 tons was reached in 1914, and from then on its production declined rapidly until 1927, when it was abandoned. This field was reopened after World War II, but in 1956 it produced only about 280 tons.

The Ghardaqa Field.

Just as the Gemsa field was reaching its peak another field was discovered (in 1913) near Ghardaqa, the administrative capital of the Red Sea district. Worked by Anglo-Egyptian, this is Egypt's longest-producing field - from 1915 to 1938, it was by far the largest contributor to the country's total petroleum output. In 1919, the company was obliged to enlarge the Suez refinery to handle its yield. The Egyptian government also began in 1919 the operation of a small nearby refinery to process its share of crude oil received as royalty from the Ghardaqa field. This field reached its production peak in the year 1931, when it yielded 291,000 tons, and it has since gradually declined. Production during the year 1956 was only about 37,000 tons.[5]

The Abu Durba Field.

The third field to be discovered and the first producing field to result from prospecting in western Sinai was the Abu Durba field, on the coast of the Gulf of Suez nearly 110 miles from Suez, tapped in 1921. However, it has contributed the least of any of the fields opened to date. Its maximum annual output, that of 1927, was only 1300 tons, and it was abandoned in 1945,

Present Fields

The Ras Gharib Field.

The most important petroleum discovery so far has been the field at Ras Gharib, on the west coast of the Gulf of Suez opposite the abandoned Abu Durba field. Tapped in 1938, its annual yield since 1941 has exceeded a million tons. Fortunately this field came in just as the Ghardaqa field was beginning to decline. In 1941 the country's total output of crude petroleum was 1, 216, 900 tons, as compared with 669, 300 tons in 1939, and the contribution made by Ras Gharib to the success of the Allied forces in the North African campaign can scarcely be overestimated. In response to the urgent need of oil on the Libyan front, this new well was exploited to the utmost. The petroleum products it furnished the Allies gave them a tremendous advantage over the acutely short-rationed Germans. With 1, 027, 324 tons produced in 1956, Ras Gharib is still Egypt's leading field.

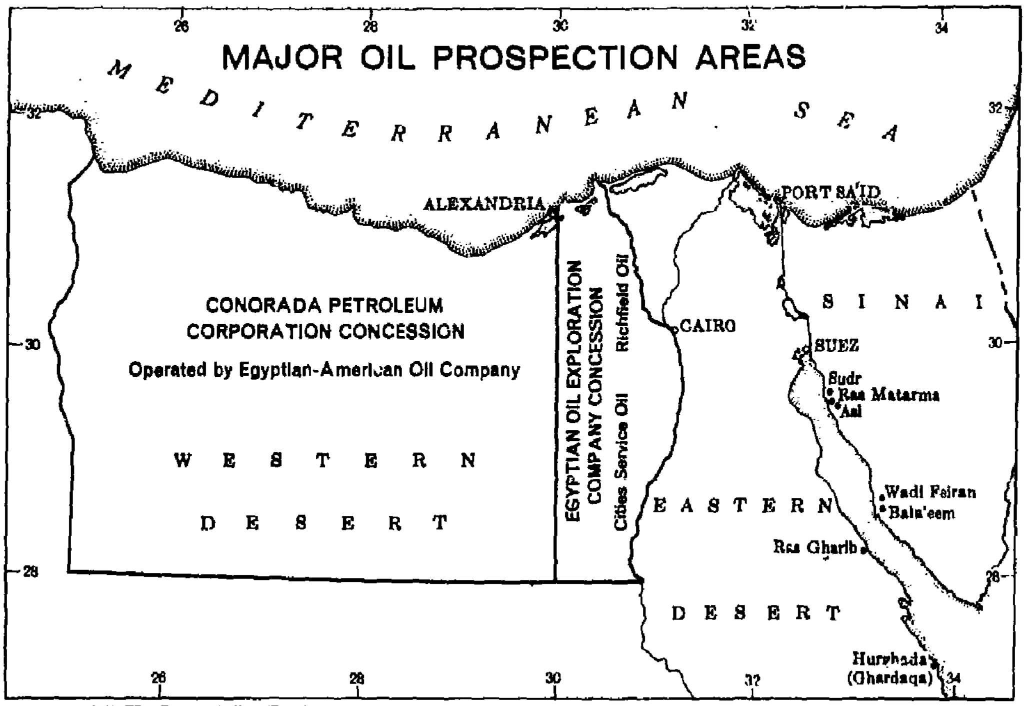
Postwar Prospecting.

Since the war, western Sinai has been the major field of petroleum prospecting. Particularly extensive explorations were undertaken jointly by the Anglo-Egyptian Oilfields Company and the Socony-Vacuum Company of Egypt. Their first substantial success was in two fields a few miles apart near the Gulf of Suez: the Sudr field, about thirty miles from Suez, discovered in 1946, and the Asl field, a little less than ten miles to the southeast, discovered in 1948. For several years these two fields together contributed well over a million tons a year. Both, however, may be short lived, since water encroachments from underlying limestone formations are greatly accelerating their flow. The Sudr field appears to have reached its peak in 1949, when it produced 791, 000 tons; for 1956 its yield was down 262, 500 tons. The Asl field has also declined greatly from a peak of 820, 000 tons produced in 1953. In 1956 it yielded only about 141, 000 tons.

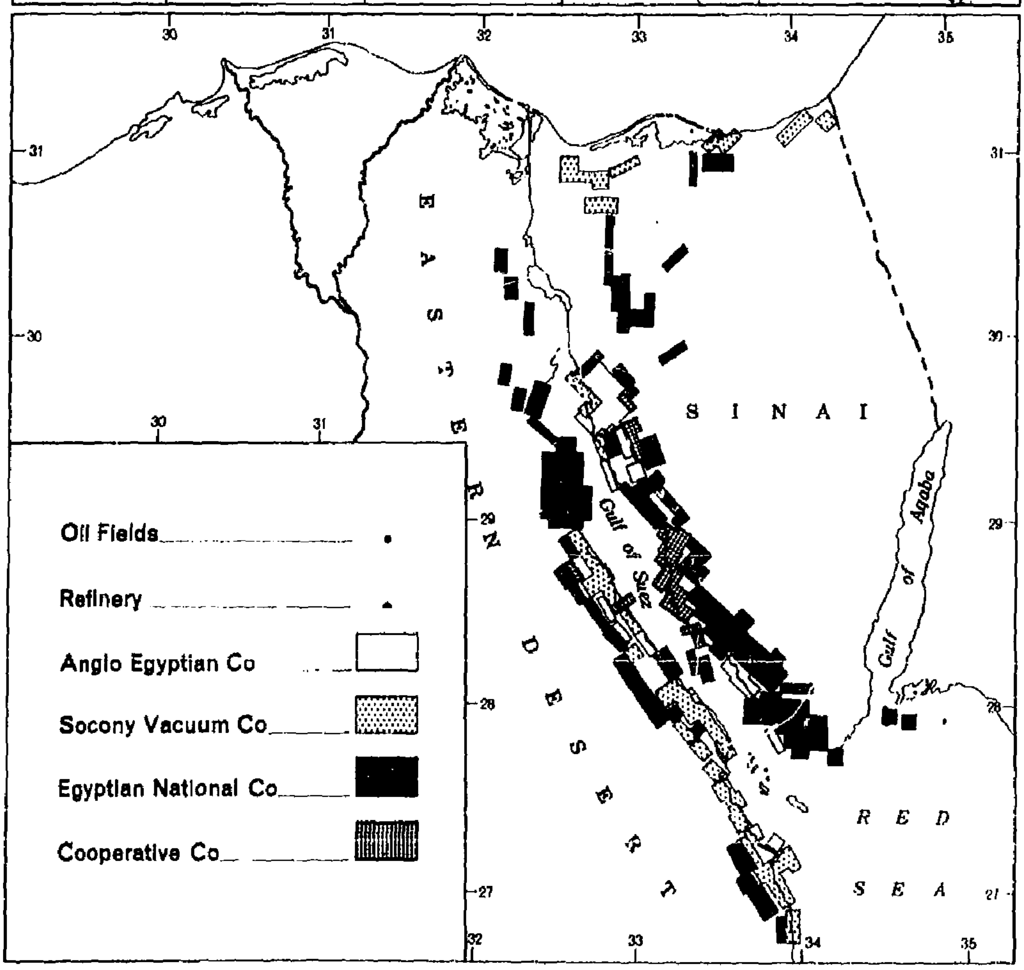
Between 1910 when the first well was brought in and the end of 1953, the six fields described in this and the preceding section yielded a total of 28, 022, 400 tons of crude oil, of which Ras Gharib contributed 61 per cent, Ghardaqa 16. 3, Sudr 11. 1, Asl 10. 8, Gemsa 0. 7, and Abu Durba 0. 1. [6]

Other Fields of Promise.

Two other localities near the Gulf of Suez in western Sinai began to show promise after World War II. One is midway between the Sudr and Asl fields, at Ras Matarma, where the Anglo-Egyptian - Socony-Vacuum combination struck oil in 1948, and the other is in the Wadi el Feiran, just north of the abundant Abu Durba field, where the Standard Oil Company brought in a small flow the same year. The latter company acquired extensive prospecting concessions after World War II in western and northern Sinai, in a region between Sinai and Cairo, and in the Faiyum basin. After three years of exploration and a reported expenditure of some $16, 000, 000 its only discovery of petroleum was the Wadi el Feiran strike. The initial yield there was considered too small to warrant further operations, particularly in view of the restrictions imposed by a Mining and Quarries Law enacted in 1948, and in 1950 the company relinquished all its prospecting concessions. However,



MAJOR OIL PROSPECTION AREAS
MEDITERRANEAN SEA
ALEXANDRIA
PORT SA'ID
CAIRO
SUEZ
SINAI
Sudr
Ras Matarma
Asl
Wadi Feiran
Bala'eem
Ras Gharib
Hurghada
(Ghardaqa)
CONORADA PETROLEUM
CORPORATION CONCESSION
Operated by Egyptian-American Oil Company
WESTERN
DESERT
EGYPTIAN OIL EXPLORATION
COMPANY CONCESSION
Richfield Oil
Cities Service Oil
EASTERN
DESERT



EASTERN DESERT
SINAI
Gulf of Suez
Gulf of Aqaba
RED SEA
Oil Fields
Refinery
Anglo Egyptian Co
Socony Vacuum Co
Egyptian National Co
Cooperative Co

recent drilling in this field has produced substantial results, as will be discussed later.

Government Legislation

The Mining and Quarries Law of 1958.

The 1948 law brought prospecting outside the Gulf of Suez region practically to a standstill, in spite of much interest on the part of a number of companies in obtaining concessions. Largely because there was no proper law, soon after World War II the government and the petroleum companies with exploring concessions became involved in a series of conflicts over such matters as limitations on investments by foreigners in operating companies, leases, taxation, and prices. The law passed in 1948, presumably to clear the situation, served only to worsen it. Whether or not that was the intention, the law came very close to putting an end to all mineral exploration by foreign companies, since it provided that they could obtain licenses for prospecting only and that leases for the exploitation of any finds they might make could be granted only to companies in which a controlling interest was held by Egyptians.

The 1953 Amendments.

One of the first steps to promote industrial development taken by the new regime after the 1952 revolution was to remove the major obstacles to foreign investment in exploration and exploitation set up by the 1948 law. In February, 1953, it passed a series of amendments to the law of 1948 which standardized government royalties and assured to foreign companies equal rights with Egyptian companies with respect to exploitation leases. Also, although these amendments provided that the General Companies Law (see Chapter 9, Manufacturing) was to be extended to cover petroleum companies, the proportion of Egyptian capital required to be invested in any company was reduced from 51 to 49 per cent. In addition, an amendment reduced from 25 to 20 per cent the proportion of the petroleum (crude or refined) produced that had to be reserved for government purchase. On the other hand, provisions in the 1948 law were retained which required that oil was to be sold to the government at ten per cent below the current world market price and that the first call on the petroleum produced in any year must be to satisfy local needs.

The new government's desire to promote prospecting for petroleum in all parts of the country with all possible speed and to increase actual production is expressed in a number of provisions in the law as now amended. For example, if there is no drilling within five years of the date of issue of a prospecting license, the annual rent on the area covered by the license is to be increased progressively until drilling begins. Since before the amendments were enacted, prospecting had been carried on mainly in Sinai and the Eastern Desert, special provisions were made to encourage it in the relatively virgin Western Desert. For a five-year period following the enactment of the amendments the yearly rent for concessions in the Western Desert was reduced to one-fourth that levied on concessions in Sinai and the Eastern Desert and royalties on any production during that time were reduced

to two-thirds. A further inducement was to raise the maximum area that could be covered by a prospecting license in the Western Desert to 400 square kilometers as compared with 100 in the Eastern Desert and Sinai. Also, while no guarantee was given that a company discovering petroleum in Sinai and the Eastern Desert would have prior rights to leases for exploiting its discoveries, provision was made for exploration-exploitation concessions in the Western Desert.

Recent Prospecting Concessions and Discoveries

New Wells.

The amending of the Mining and Quarries Law produced an immediate revival of petroleum prospecting. One of the earliest results was the renewal of operations in the abandoned Wadi el Feiran by the granting of a concession there to the Egyptian Cooperative Company for Petroleum. This company assigned drilling operations to the National Petroleum Company of Egypt, a new combine formed by the Southern California Petroleum Company, the International Petroleum Company of Egypt, and certain Swiss and Belgian interests. Prospecting for this combine has been carried on by Southern California Petroleum with remarkable success. Early in 1954 a new well was brought in with an initial production potential of about twenty tons a day. In 1956 this well and a recent well opened in 1955 in the same field together produced 37,250 tons. In January, 1955, another well, fifteen miles south of this strike and called Bala'eem Well No. 1, was brought in with a daily production of 310 tons, and in May of that year a third strike, Bala'eem Well No. 2, was made, for which a daily yield of 430 tons was estimated.[7] By 1956 seventeen wells were in operation in the Bala'eem field and produced 226,905 tons that year. The Bala'eem reserves are in Miocene sands and are estimated at nearly 72,000,000 tons.

In spite of the contribution of these new wells, production has been declining since the high of 2,209,000 tons was produced in 1952 (see Table 2). In 1955 it had fallen to 1,818,380 tons and in 1956 to 1,738,372 tons. However, the 1956 production might have approached the 1952 high if all well operation had not been suspended when the Israeli invasion began in October. Production was not resumed until early in 1957.

The National Petroleum Company is now one of the principal prospecting companies in the Gulf of Suez region and in northern Sinai and has also acquired concessions in the Wadi Rayan southwest of the Faiyum basin. In April, 1954, the Anglo-Egyptian - Socony-Vacuum combination was granted a thirty-year lease, renewable for another fifteen years, to operate the Ras Matarma discovery in western Sinai, as well as licenses for further prospecting in Sinai and the Eastern Desert, but both this lease and the licenses were included in the sequestration edict of 1956.

Concessions in the Western Desert.

A number of companies new in the field have also contracted for exploration and exploitation. Among these is the Conorada Petroleum Corporation, to which a concession in the Western Desert was granted covering an area of about 75,000 square miles, divided into 456 blocks, bounded on the east by the meridian of 30°

east, on the south by the 28th parallel, and on the west by the boundary with Libya, and including on the north the tideland waters of the Mediterranean coast. This concession was for thirty years, with a renewal option for another thirty years, and no payment of rent was required for the first twelve years. The company in return gave its guarantee that it would spend $8,000,000 on exploration during the first six years of the concession period.

Management and operation of the Conorada concessions were subsequently transferred to the Sahara Petroleum Company, a new organization of which the stock is owned by four American companies: Continental Oil, Ohio Oil, Cities Service Petroleum, and Richfield Oil. A subsidiary of this company, the Egyptian Oil Exploration Company, has exploration and exploitation concessions covering the section of the Western Desert between the eastern border of the Conorada concessions and the Nile valley. Sahara Petroleum carried on active exploration during the summer of 1957. After the Israeli invasion of Egypt in October 1956, its seismic and drilling operations were temporarily halted, but were resumed on assurance by the Egyptian government that the company's contract and operations would not be affected by the movement toward nationalization of the country's basic industries.[8]

Refinery Production and Local Consumption

Crude oil from the various wells now in operation goes by short pipelines to nearby coastal loading ports on the Red Sea and Gulf of Suez and is then shipped by tankers to the Anglo-Egyptian and government refineries at Suez. Both refineries have been enlarged several times as the local production of crude oil has increased. The Anglo-Egyptian refinery can now process 2,000,000 tons of crude oil a year. The government's refinery handles crude oil purchased and received from the producing companies. Increases in the volume of the royalties since World War II (royalties run from 15 to 35 per cent of the crude oil production) has made necessary repeated enlargements of this refinery. In the early postwar period its capacity was only 400,000 tons of crude oil a year, but as of 1954, it could handle 1,300,000 tons. The combined annual capacity of the two refineries is thus 3,300,000 tons, or considerably more than a third in excess of present production. A refinery at Mostorod Station north of Cairo is under construction and another is planned at Alexandria if new discoveries, particularly in the Western Desert, are such as to warrant its construction.

The most recent published reports on refinery production are shown in Table 3.[9] Present production is nearly double that of the early 1940's. Of the total, the Anglo-Egyptian refinery handles between 80 and 85 per cent. Of fuel oils, which make up about 75 per cent of the refinery products three types are produced - mazout (a heavy boiler oil), diesel, and solar. Gasoline and oil together account for about twenty per cent and asphaltic bitumen and other products (including bottled gas) five per cent. No lubricating oils are produced. The local consumption requirements of these - 25,000 to 30,000 tons a year - are supplied by imports.

Table 3 - Crude Oil and Refinery Production (in thousand tons)

Year	Crude oil	Fuel oils	Kerosene	Gasoline	Asphaltic bitumen
1949	2276	1621	117	219	92
1950	2365	1761	150	200	80
1951	2368	1665	196	202	90
1952	2377	1777	200	177	51
1953	2388	1767	198	180	39

Refinery products go by pipeline, railway and truck tanks to Cairo, the main distributing center. The first Suez-Cairo pipeline was financed by the United States government and constructed by U. S. Army Engineers during World War II to speed up the transport of supplies to the Allied forces in the Western Desert. After the war it was turned over to the British Army, which leased it to the Anglo-Egyptian Oilfields Company. When in 1954 the British government agreed to withdraw its troops from the Suez Canal it also ceded this pipeline to the Egyptian government, which then leased it to Anglo-Egyptian. It was, however, included in the properties of the company that were sequestered by the Egyptian government after the Israeli-Egyptian hostilities in the autumn of 1956.

In 1954 the Egyptian government contracted with an Italian company for the laying of a second pipeline to carry crude oil to a refinery to be constructed at Mostorod Station, a short distance north of Cairo. Work on both pipeline and refinery was begun in June, 1955, and the inauguration of both was celebrated on July 24, 1957.[10]

Petroleum Imports

The £E 14,500,000 (about $41,600,000) paid for imports of petroleum products in 1953 (see Table 2) placed them second in value to imports of wheat and wheat products. Fuel oils make up about two-thirds of the petroleum imports, kerosene twenty per cent, and gasoline nearly ten per cent. Some crude and partly refined petroleum is imported for local refining, but only a relatively small amount - 296,578 tons in 1953, valued at £E 1,801,830 (about $4,773,054). In 1954 plans were completed for the creation of an Egyptian company to own and operate a tanker fleet for importing petroleum products, and in December of that year the first tanker was purchased and put into service transporting products from Persian Gulf refineries.

Marketing Companies

In recent years the distribution of domestic refinery products in Egypt and the importing of foreign products has been handled by seven companies: Shell Company of Egypt, Socony-Vacuum Company of Egypt, Esso Standard (Middle East), Société Égyptienne des Pétroles, Egyptian Independent Oil Company, Egyptian Cooperative Company for Petroleum, and Nile Oil Company. (No information is available on how nationalization of Egyptian industries has affected these agencies.)

The Shell Company, established in 1911 as the Asiatic Petroleum Company and operating under that name until 1927, is the oldest in the country and since it has been the major marketer of Anglo-Egyptian products the largest. Socony-Vacuum also operated as a marketing company for many years before it joined with Anglo-Egyptian to exploit the Sudr and Asl fields. Esso Standard, a subsidiary of Standard Oil of New Jersey, marketed mainly Esso products. In 1958 it bought out the Swiss Société du Napthe, whose operations covered Egypt and several Middle Eastern countries. In September, 1950, Esso Standard also acquired the assets of the then inoperative Standard Oil Company of Egypt. The Société Égyptienne, of dominantly French ownership, had marketing agreements with the California Texas Oil Company and also controlled the prospecting activities of the National Petroleum Company. Nile Oil, a small company of mainly foreign ownership, was engaged in oil importing.

The only Egyptian-owned marketing concerns were the Egyptian Independent Oil Company and the Egyptian Cooperative Company for Petroleum. The latter, established in 1934 and the older of the two, was originally organized solely for local marketing, but its activities were extended to exploitation by the acquisition in 1953 of the Standard Oil concession in the Wadi el Feiran in western Sinai. The Independent Oil Company operated mainly as the distributing agent for products of the Sinclair Oil Refining Company.

PHOSPHATE

Phosphate mining, which has been greatly expanded in recent years, is second in production value to petroleum among Egypt's mineral industries. Production in 1956 was 615,000 tons as compared with 107,000 in 1925. Deposits of considerable extent have been found at many places in the deserts, where they are associated with Upper Cretaceous formations. East of the Nile they occur near the Red Sea coast in the neighborhood of Quseir and Safaga, in the South Galala plateau, in the Tih plateau of central Sinai, and at the edge of the Nile valley near the village of El Siba'iya, a short distance south of Isna. In the Western Desert deposits have been located in the oases of Bahariya, Farafra, Dakhla, Kharga, Dungul, and Kurkur and form a continuous belt from the western edge of the Dakhla Oasis to the border of the Nile valley.

Egyptian phosphate finds a ready market abroad for industrial use because of its high tricalcic content, but in spite of the wide occurrence of the

deposits, exploitation remains concentrated in the Safagam Quseir, and Saba'iya beds. Lack of road or rail connections with the main railroad lines or with transport on the Nile makes the mining of most of the desert deposits uneconomical. Thus the high cost of transportation caused the temporary abandonment in 1925 of the Saba'iya deposit, which had been leased for exploitation as early as 1908. For, until a plant for the manufacture of superphosphate was opened in 1936 at the industrial center of Kafr el Zaiyat in the delta, practically all the phosphate mined was exported, which meant that the cost of transportation to Alexandria, the only outlet for Saba'iya phosphate, was too great for profitable exploitation of this deposit. But in 1936 operations were resumed at Saba'iya to supply the new plant, and now about 50, 000 tons of phosphate, ten to fifteen per cent of the country's total output, are mined there annually. The bulk of the production from the other deposits is exported as it comes from the mines, principally to the Far East, South Africa, and Australia, with Japan the major customer.

The Safaga deposits are mined in three depressions connected with the Wadi Safaga. They were discovered in 1909-1910 and the concession to exploit them was granted to a British concern, the Egyptian Phosphate Company, which was organized for the purpose. (The company has now been nationalized.) A narrow-gauge, sixteen-mile railroad carries the phosphate to the loading pier at Safaga, on the site of an ancient Red Sea port. The present settlement here owes its existence to the mining and shipping operations.

Commercially the country's most important deposits are in the Quseir area, where mining operations are confined chiefly to two beds known as Gebel Duwi and Gebel Hamadat. The original concessionaire, an Italian company, the Societa Egiziana per l'Estrazione ed el Commercio dei Fosfati, which had handled the mining operations since it was granted the exploitation lease in 1912, was nationalized in 1956. The mines are connected by a short, narrow-gauge railroad with a loading pier at Quseir, also a trading settlement in ancient times and now entirely dependent on the employment provided by the mining company. The company maintained a school and a hospital here and furnished the settlement with water (by means of a condensation plant) and with electricity.

MANGANESE

Third in value among Egypt's mineral products is manganese. The greatest annual yield reported to date, that of 1953, was 284, 000 tons; 200, 000 tons were mined in 1956. The entire production is exported. Two-thirds of it has been going to the United States and the remainder to various European countries.

The manganese mines now in operation are at Um Bogma on the western side of the Sinai peninsula, fifteen miles inland from the coast, and have been worked by a British company which has now been nationalized. (A deposit, as yet unexploited, has also been located at Gebel Alda, about thirty miles north of Qena, to the east of the Wadi Qena.) The ore mined at Um Bogma consists

chiefly of oxides of manganese and iron. The shipping port and company headquarters are at Abu Zenima, on the Gulf of Suez about 65 miles south of Suez, where a small bay affords sheltered anchorage. Transport of ore from the mines and of supplies for them is provided by a narrow-gauge railroad which runs inland from Abu Zenima to the foothills, where it connects with a six-mile aerial ropeway over mountainous country.

NATRON AND TALC

The only other minerals at all extensively exploited in Egypt are natron and talc.

Natron

Natron, natural soda, occurs as a mixture of sodium carbonate and bicarbonate, with admixtures of other salts such as sodium chloride and sulphate and calcium carbonate and sulphate. The principal known occurrences are in the Wadi el Natrun off the western edge of the Nile delta, in the neighborhood of Barnugi in southwestern Beheira province, and at El Mahimid north of Idfu. Patches have also been located in the Wadi Tumilat, east of the delta, and along the edge of the Nile valley between Qena and Aswan.

Exploitation today, as for thousands of years, is confined chiefly to the Wadi el Natrun. Natron provided a basic material used in the embalming processes of the ancient Egyptians, and the world's first discovery of natural soda may have been made in the Wadi el Natrun. The wadi is an enclosed basin some 35 miles long. The natron is formed in solid incrustations under and around the water of a chain of shallow lakes which occupy the wadi's bottom, below sea level. [11]

A private company, the Egyptian Salt and Soda Company, which has now been taken over by the government, worked the Wadi el Natrun deposits for many years extracting the various salts found mixed with the sodium carbonate and producing from it chiefly caustic soda and soda ash (anhydrous sodium carbonate). The total production is consumed locally in glass making and the manufacture of soap, cleaning and refining compounds, and dyes. A narrow-gauge railroad nearly thirty miles long connects the plant with the State Railway system near Khatatba.

The average production in recent years of around 2500 tons of caustic soda supplies only about fifteen per cent of the local requirements. In 1951, 7750 tons of natron were dug, as compared with 3750 in 1939, but operations now show signs of slackening. Also the quality of the Wadi el Natrun deposits seems to be declining; twelve cubic meters were required in 1951 to produce a ton of caustic soda, as compared with half or two-thirds that amount in previous years. Moreover, even when the quality was better than now, there were frequent years when the cost of production was higher than the import rates.

Talc

Talc occurs in abundance in a number of localities in the Eastern Desert, associated with schist, serpentine, and magnesium limestone. It was worked by the ancient Egyptians for making beads and other small objects; many of the scarabs that have come down from early times are of glazed talc. The desert nomads use it today for making fireproof cooking utensils and pipes. Present-day extracting operations on a commercial basis were developed during World War II to supply local industries which had previously depended on imports. These industries are concentrated at Gebel Um Huweitat (about 40 miles from the Red Sea and almost due east of Idfu), in the Wadi Qul'an (near the Red Sea coast north of Ras Banas), and at Bir el Hamr (about twelve miles east-southeast of Aswan). Production reached 5229 tons in 1941, but had fallen off to 3757 tons in 1951, owing to competition from foreign-made products and the high cost of local mining and transport.

IRON

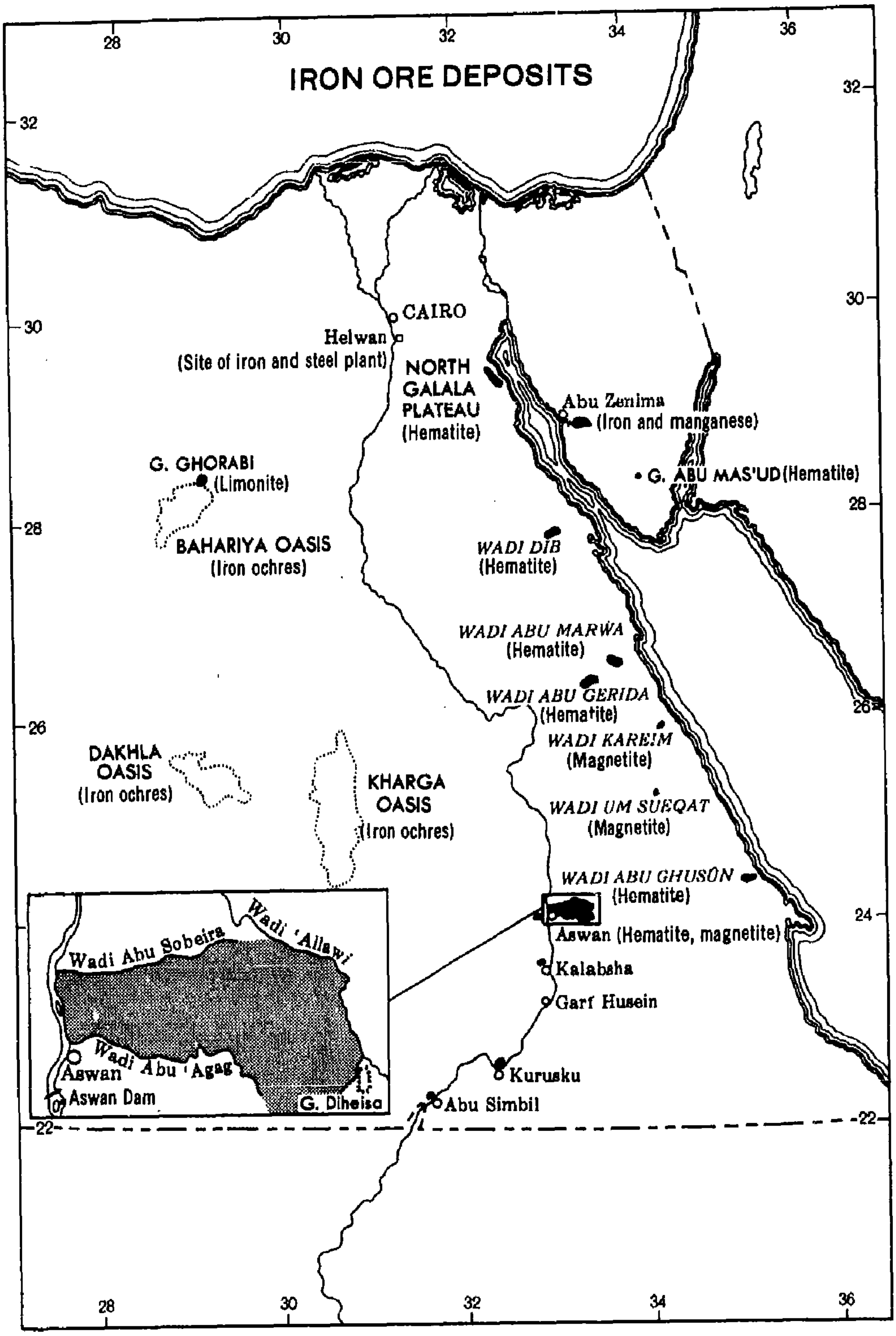
Numerous iron deposits, widely distributed and many of them of considerable size, have long been known in Egypt, but none of them has been much exploited owing to the lack of fuel or electrical power for local manufacture and to the heavy costs that would be involved in transporting the ore to seaports from even the most accessible deposits. The existing iron and steel industry, which dates only from 1949, consists of three small plants. Using heavy oil or electricity, or both, for furnace heat, these plants depend entirely on scrap iron, most of which today consists of military equipment abandoned by the Allied forces during and following World War II.

Mining of iron ore up to the present time has been limited almost exclusively to obtaining ochers or other oxides for use as pigments in paint manufacturing. The ancient Egyptians carried on rather extensive operations in the Aswan region and the oases of the Western Desert to provide the color for their still brilliant tomb paintings, and traces of their smelting works have been found in the ironstone and ocher deposits in the area west of Aswan. Similar remains in the ferruginous Nubian sandstone in the Wadi Abu Agag (on the east side of the Nile a few miles north of Aswan) and an inscription still to be read there indicate that these were also worked.[12]

The mining of ochers was considerably stepped up during World War II, owing to the scarcity of imported pigments, but after the war, as foreign-made colors and dyes became available again, it experienced a rapid decline. Production in 1942 was 6732 tons as compared with 719 tons in 1939, but in 1951 it was down to 836 tons.

Iron Ore Deposits

In the Eastern Desert iron-ore deposits are known in the Aswan district and in the Wadi Abu Gerida, about 45 miles northeast of Qena. Magnetite and hematite deposits have been located near the Gulf of Suez and the Red


IRON ORE DEPOSITS
CAIRO
Helwan
(Site of iron and steel plant)
NORTH GALALA PLATEAU
(Hematite)
Abu Zenima
(Iron and manganese)
G. ABU MAS'UD (Hematite)
G. GHORABI
(Limonite)
BAHARIYA OASIS
(Iron ochres)
WADI DIB
(Hematite)
WADI ABU MARWA
(Hematite)
WADI ABU GERIDA
(Hematite)
WADI KAREIM
(Magnetite)
DAKHLA OASIS
(Iron ochres)
KHARGA OASIS
(Iron ochres)
WADI UM SUEQAT
(Magnetite)
WADI ABU GHUSÔN
(Hematite)
Aswan (Hematite, magnetite)
Kalabsha
Garf Husein
Kurusku
Abu Simbil
Wadi Abu Sobeira
Wadi 'Allawi
Wadi Abu 'Agag
Aswan
Aswan Dam
G. Diheisa

Sea in the Wadi Abu Ghusun, at Um Sueqat, in the wadis Abu Marwa and Dib, and also on the eastern slopes of the North Galala Plateau, to name the occurrences from south to north. In Sinai the principal known deposits are in the western part of the peninsula in the Um Bogma mining district and in Gebel Abu Mas'ud in the south. At Um Bogma the ore is mined primarily for the manganese oxide richly associated with it, as already noted.

In the Western Desert there are deposits of ochers in the Bahariya, Dakhla, and Kharge oases. The most important are in Bahariya, where rich occurrences of ocher and limonite are reported. The most prominent exposure there is predominantly of limonite at Gebel Ghorabi at the extreme northern end of the depression.[13]

The most extensive iron-ore deposits, with the greatest potentialities for exploitation because of their accessibility to Nile transport, lie east of Aswan. They are found in an area of about 485 square miles, which extends eastward from the Nile valley for 30 miles with an average width of 12 miles. Although the deposits, a dark red, oölitic hematite, come to the surface or lie close beneath it over large areas, they are not continuous. Furthermore, they do not form solid masses but consist of rather thin, separated layers. The ore averages 70 per cent iron oxide, equivalent to 20 per cent metallic iron. There is almost no sulphur in the ore, and the content of silica and phosphorus oxide is also low.

Plans for an Iron and Steel Industry

The Permanent Council for the Development of National Production, set up after the 1952 revolution, announced the signing of a contract by the government in April, 1954, with a combination consisting of the Industrial Bank, the Bank Misr, the Misr Association for Spinning and Weaving, the Misr Insurance Company, and a West German firm, for the erection of iron and steel plants for processing Aswan ore. The plants are to be built at Helwan in the valley about 6 1/2 miles south of Cairo at an estimated cost of £E 16,500,000 (about $47,000,000).

Smelting coke for these new plants is to be imported, but limestone, manganese, and dolomite and other refractories will be obtained from local sources. It is expected that electricity for furnace heat will come from the generators now under construction at the Aswan Dam and eventually, also, from those to be included in the high dam proposed for construction a short distance upstream from the present Aswan Dam (see Chapter 5, Irrigation). The contract calls for the production of 120,000 tons of iron and steel during the first year of operation and thereafter for an annual production of 235,000 tons. At that rate it is estimated that the Aswan ore will meet the industry's requirements for at least thirty years. (This estimate takes into account only the surface deposits, which have been assessed with some care, and is without reference to unassessed reserves which may be assumed to lie beneath them.) The State Railway Department has undertaken to build a rail line of nearly twenty miles to connect the field with the town of Aswan, from

which the ore will be transported to Helwan by barge.

OTHER MINERALS

Deposits of many other minerals are known in Egypt, some of them the sites of ancient mining and quarrying operations. A few are being worked to some extent, and others await further examination, but most of them are in too small quantities, or of too patchy distribution, or too far from rail, river, or sea transport under present conditions to warrant any attempts at extensive exploitation.

Metallic Minerals

Chromite.

Chrome iron ore is worked on a small scale in the Barramiya district, about 60 miles east of Idfu, for local use in the manufacture of pigments, coloring pottery, and tanning. It has been reported, also, at other places in the Red Sea Mountains: at Gebel Dunqash, at Gebel Abu Dahr near the coast, and near Um Kabu in the Wadi Gemal.

Copper.

That copper was mined in the Eastern Desert and Sinai as far back as predynastic times is indicated by hieroglyphic inscriptions and by numerous long-abandoned mines and remains of smelting works. In Sinai evidences of ancient mining and smelting operations have been found in the western part of Barabit el Khardim in the Wadi el Garf, at Gebel Um Rinna in the Wadi Kharig, and in the Wadi Nasb. The remains of smelting works in the Wadi Nesb are particularly impressive. In the Eastern Desert most of the old mine sites are in the southern part of the Red Sea Mountains; the largest are at Um Samyuki (at the head of the wadi of the same name), northwest of Ras Banas, and at Seyal (northwest of the Um Gareiat gold mine in the Wadi el Alleqi). At the Um Samyuki site tunnels have been found extending to depths of nearly fifty feet.

Most of the ancient mines have been examined during the present century to determine their potentialities for further exploitation, but only the Samyuki mine has appeared worth reopening. Some rich ore was extracted there, but it was found only in small pockets and those thinned out rapidly as shafts were sunk. These conditions, plus the difficulty of extending the shafts below the water table, made it evident that further work there could not be economically justified, and the mine was again abandoned. Other deposits have been discovered in the Eastern Desert, but so far none that offered any prospect for profitable exploitation.

Lead.

Lead ores (lead carbonate and sulphide) have been found along the Red Sea coast north of Ras Banas, in the Wadi Hamr near Aswan, and in the Wadi Shellal in western Sinai. Present extractions, amounting to only a few hundred tons annually (529 tons in 1951) and all exported, come from the Red Sea coast deposits - at Ranga, where the ores occur in gypsum beds associated

with sulphur and iron pyrites, and in the Wadi Gasur, where they are in limestone. Workings at Gebel Rusas (rusas is Arabic for lead), a site between these two, where the lead ores mixed with zinc carbonate are embedded in Miocene limestone, yielded around 18,500 tons from 1913 to 1915 when they were exhausted. The Wadi Hamr deposits are in schists.

Tin.

Tin oxide (cassiterite) was first discovered in 1934 in quartz veins in Gebel Museilih (Lat. 24° 53' N., Long. 34° 01' E.) in the Eastern Desert. A second discovery was made in 1940 at Gebel 'Igla, about thirty miles eastward from Museilih. Some mining is carried on at both deposits, but the total production is small. The product is concentrated into pigs at the mines; seven tons of pig tin were produced in 1951.

Wolfram.

The first reported discovery of wolfram (manganese iron tungstate) was made in 1930 in quartz veins in the Wadi el Dob (Lat. 26° 27' N., Long. 33° 28' E.) and wolfram has since been found in the same association nearby at Abu Kharif near Gebel Abu Marwa, and at Um Busilla (Lat. 25° 21' N., Long. 34° 01' E.). It occurs, also, in fairly large amounts with the tin ore at Gebel 'Igla. During World War II there was considerable working of these deposits to supply local metallurgical industries; 3346 tons were produced in 1941. Since the war exploitation has been sporadic; only fifteen tons were mined in the period 1947-1949, but production was up to 1422 tons in 1951.

Molybdenite.

Molybdenite is found in quartz veins in red granite formations in the Red Sea Mountains, and it has been worked in the ranges west of Ghardaqa, in the Qattar range, and in the foothills of Gebel Abu Harba. Production, however, has at all times been small and none has been reported in the official statistics in recent years. Occurrence is also reported a short distance north of Gebel el Dob, and at Gebel Um Disi, on the eastern flank of Gebel Abu Marwa, and in the Wadi Dib.

Nickel.

The only known occurrence of nickel is on St. John's Island (Zeberged) near the Red Sea coast about thirty miles southeast of Ras Banas. There veins of garnierite (hydrous silicate of nickel and magnesium) are reported in the peridotite hill of the island. No working of these veins has been reported.

Zinc.

As noted above, zinc ores have been found mixed in small quantities with other ores in the Eastern Desert - carbonate of zinc with lead ores on the Red Sea coast and zinc sulphide in association with copper ores in the Red Sea Mountains, notably in the Wadi Samyuki.

Precious Metals

Gold.

Gold is found in Egypt in the Red Sea Mountains, particularly in the southern part, where it occurs in quartz veins in pre-Cambrian schists. Gold working was a highly developed craft among the ancient Egyptians. Although there are indications that they worked the quartz veins to some extent, it would appear that their operations were mainly confined to deposits in which the metal had been weathered from veins and then highly concentrated by wind action on the detritus. Many of the old workings have been found, and all modern mining has been confined to them; but while practically all of them have been prospected in this century, only a few have offered any promise. Most of them are in the larger wadi systems opening to the Nile valley, mainly in the El Allaqi, Sha'it, 'Abbad, and Hammamat wadis, but others have been found north of the Wadi Hammamat on the eastern slopes of Gebel Semna (Lat. 26° 26' N., Long. 33° 35' E.) and at Gebel Fatiri (Lat. 26° 48' N., Long. 33° 20' E.), and along the Red Sea coast.

Mining was resumed at those at Haimur, Um Gareiat, and Um el Tiur in the Wadi el Allaqi, at Barramiya in the Wadi Sha'it, at Atalla in the Wadi Hammamat, at Gebel Semna, and at Gebel Sukkari and Um el Rus near the Red Sea coast north of Ras Banas. While fair production was obtained from some of these and some rich pockets were found, they were for the most part small and patchy. All the workings had been abandoned by 1927, owing to the cost of operation as related to world gold prices. However, with the improvement of prices immediately before World War II, some were again opened with the government undertaking the exploitation of those at Sukkari, Barramiya, and Um el Rus. Since then operations have fluctuated rather widely from year to year, but have recently been considerably increased. Production of refined gold amounted to 119.83 kilograms in 1948, 474.48 in 1951, and 481.94 in 1954 as compared to only 93.76 in 1945, but only 218.27 kilograms were mined in 1956.

Silver.

In Egypt silver has been found only in association with gold. In such association the ratio to gold is often as high as 20-40 per cent. The ancient Egyptians used little silver as compared with gold, but they did make much use of electrum, the natural alloy of gold and silver. A major site of their mining operations for electrum is near the mouth of the Wadi 'Abbad.

Platinum.

Small amounts of platinum are found in association with ultrabasic rocks, and it is occasionally mined with other minerals. It has also been reported on St. John's Island.

Nonmetallic Minerals

Alum.

Aluminum sulphate deposits in the Kharga and Dakhla Oases were worked during World War II, when it became necessary to find a local product

to replace imports for use in dyeing, water purification, and tanning and pigments. Magnesium sulphate was mined at the same time from the same localities; 700 tons of aluminum sulphate and 710 of magnesium sulphate in 1942. No production has been reported since the war.

Asbestos.

Although numerous occurrences of asbestos in serpentine masses in the Eastern Desert have been reported, the veins prospected to date are small and their quality inferior. Mining is of recent development, with the principal site in the southeast near Gebel Gerf. Production in 1951 was 1247 tons.

Barite.

Veins of barium sulphate have been found in faulted igneous rocks in the Bahariya Oasis, at Gebel 'Urf toward the head of the Wadi Dib near the southern end of the Gulf of Suez, and also about 20 miles southeast of Aswan. This last mentioned occurrence is being worked on a small scale.

Corundum.

Corundum (aluminum oxide) has been discovered in the Barramiya mining district in the Wadi Sna'it and in the Hangalya district (Lat. 24°50' N., Long. 34° 35' E.) northeast of Gebel Negrus. The ancient Egyptians may have used the crystals for engraving stone, but the deposits now known have still to be examined as to their potentialities for commercial exploitation.

Feldspar.

Feldspar is worked east-southeast of Aswan in outcrops of pegmatite, in which there are dykes composed almost entirely of orthoclase feldspar. The product is used mainly as a flux in making glazed pottery, but the potash content is so high - ten to fifteen per cent - that some practice is made of grinding it and using it locally for fertilizer.

Graphite.

There has been some mining of graphite in the Barramiya mining district and in the Um Gariet gold mine, but the last report in the official statistics was of only fifty tons mined in 1948. Other occurrences are reported in the ultrabasic rocks in the southern part of the Eastern Desert.

Kaolin.

A few hundred tons of kaolin are quarried annually (241 tons in 1951) for use in making earthenware and for filters in the textile and paper industries. Quarrying is chiefly from deposits beneath the Nubian sandstones in the Wadi Abu 'Agag and the Wadi el Heita, a few miles northeast and east, respectively, from Aswan.

Pumice.

Pumice stone is quarried at various places in the mountainous sections of the Eastern Desert and in southern Sinai, for local use in polishing

and cleaning. Its production varies greatly from year to year. In 1951 only 41 tons were quarried as compared with 1650 in 1939.

Quartz.

Small quantities of quartz are quarried for the local glazing industry from a great mass intruded in mica-schist east of the Nile, a short distance from Aswan.

Refractory Clay.

Refractory clay is found in abundance in association with the iron ore deposits of the Egyptian deserts, and particularly between the ore-bearing layers of the Nubian sandstones. It was worked there by the ancients for the manufacture of household wares; and their long, winding tunnels are still to be seen. At the present time it is mined only in the Aswan district, and in very small quantities, but its extraction may well become an industry of considerable importance with the development of the proposed iron and steel industry.

Sodium Nitrate.

Sodium nitrate, mixed with sodium sulphate and chloride, occurs in patches on the exposed surfaces of the so-called Isna shales, which underlie the Eocene limestones on both sides of the Nile valley between Qena and Kom Ombo. Its occurrence is particularly heavy near El Mahamid and El Siba'iya. The nitrate content of these mixtures runs generally between five and seven per cent but is higher in places. Scrapings of them, called "tafla," are used locally to some extent for fertilizer. Examination has revealed that the sodium salts are in greatest concentration within some twenty inches of the surface, and the theory has been advanced that they are formed on the exposed surface of the shales by bacterial action.[14]

Sulphur.

Although sulphur is found widely distributed in association with gypsum and anhydrites near the Red Sea coast, its occurrence, so far as is now known, is in scattered, small amounts. Only in the neighborhood of the Ghardaqa and Ranga oil fields does there appear to be any prospect for profitable exploitation. Deposits at Qemsa were worked during the 1880's, and the first modern discovery of petroleum in Egypt was made in connection with the workings there.

Precious and Semiprecious Stones

Emeralds and peridots are the only precious stones that have been found in Egypt in past or present times. Semiprecious stones occur in considerable variety, and certain of them were much used by the ancient Egyptians for jewelry settings, but most of those found now are so small or so flawed or off-color as to be of little value.

Emerald.

Emerald mining was carried on intensively under the Pharaohs in the schists and mica-schists of the Red Sea Mountains in what are still

known as the "Emerald Mountains" - Gebel Sikait (Lat. 24° 40' N., Long. 34° 38' E.) and Gebel Zabara nearby. Mining there was also active in Roman times, and the ruins of the mines indicate that the operations were on a large scale. These mines were reopened in 1817 and again in 1905. Although no gem emeralds were found, beryl crystals came to light in abundance, but they were dull in color and, consequently, of little value. It is, in fact, a question whether the gem emeralds had been completely worked out or whether the mines had ever yielded any stones of real gem quality.

Peridot.

Some occurrences of small peridot (olivine) crystals have been reported in the ultrabasic peridotite of the Red Sea Mountains, but the gem peridot has been found only on St. John's Island in the Red Sea southeast of Ras Banas, in the peridotite of which the island is largely composed. (Zeberged, the local name for the island, is the Arabic word for peridot.) Until recent discoveries of small crystals in other parts of the world, St. John's was the only known source of peridot and the crystals mined there are still the "Noble Olivine" of the gem trade. Stones weighing up to thirty carats cut from the flawless, deep yellowish-green crystals are not uncommon. The mining of the St. John's peridot dates back to ancient times but is carried on only sporadically at present.

Semiprecious Stones.

Of the semiprecious stones worked by the ancients, turquoise alone is now mined to any appreciable extent. So far as is known, the stone has been found at only two places - at Gebel Maghara and in the Wadi Sarabit el Khadim, both near the west coast of Sinai, a few miles from the Um Bogma manganese and iron mines. At both of these places there are evidences of early workings, although the stones appear to have been entirely exhausted at Wadi Sarabit el Khadim. The Gebel Maghara deposits are still worked to some extent by the local nomads, for whom they are an important item for barter. A few merchants who market them in Cairo and Alexandria pick up the accumulations at irregular intervals. The Gebel Maghara turquoise occurs in friable pockets in beds of purplish-gray sandstones in an area of less than a square mile where faulting and folding have brought the beds near the surface.

Ancient amethyst mines have also been found at Gebel Abu el Diyab west of the Safaga phosphate mines near the Red Sea coast and near the recently discovered Cephren quarries in the Western Desert. Both have been long unworked, and no other deposits have been reported.

Azurite (blue basic carbonate of copper), garnet, red jasper, microcline (green feldspar), and rock crystal have been reported at various places in the Red Sea Mountains and elsewhere in the Eastern Desert, but nowhere in sufficient quantity to be considered for commercial exploitation.

ORNAMENTAL ROCKS

In the large areas of igneous and metamorphic rocks of the Eastern Desert and Sinai there is a wide variety of what are sometimes called ornamental rocks to distinguish them from the commoner types of building stone - that is, rocks suitable for fine building material and sculpture because of their texture, color, susceptibility to high polish and durability. Egypt is perhaps best known throughout the world today for the many examples still standing of the use of these rocks in its ancient pyramids, statues, obelisks, and other monuments. All of those described here are still available for more or less extensive quarrying, but except for the Aswan granites little use has been made of them in modern times. Among them the granites, porphyries and marbles would appear to offer the best prospects for profitable exploitation.

Igneous Rocks

Granite.

Through the ages the rocks that have been most used in Egypt for sculpture and fine construction are the granites and granodiorites of the Aswan region. There the first quarrying was carried on in the extensive outcrops of red and gray granite. The term syenite is derived from Syene, the Greek name for an ancient town at or near the site of the present town of Aswan. Although syenite is now more strictly used to designate rocks of a somewhat different type, Pliny originally applied it to the red hornblende granite of the Aswan quarries.

Aswan granites were used in many of the most famous of Egypt's antiquities. The red variety lines the passages in the Pyramids of Giza, floors the King's Chamber in the Great Pyramid, and forms the base of the Third Pyramid, and it is also to be seen abroad in the obelisks of the Place de la Concorde in Paris, in New York's Central Park, and on the Thames Embankment "Cleopatra's Needle". The statue of the Sphinx in the Vatican and some of the pillars of St. Peters are of Aswan gray granite.

The largest of the old quarries lie immediately southeast of Aswan and on Aswan (Elephantine) Island, but granite was also quarried in the heart of the Eastern Desert. Of the quarries in the Eastern Desert, among the most impressive remains are those of the Roman quarries at Gebel Fatiri (the Mons Claudianus of the Romans).

There was little quarrying of granite from the beginning of the Christian era down to the end of the nineteenth century. Then in 1898 the Aswan quarries were reopened to supply the material for the construction of the Aswan Dam, and later they contributed material for two heightenings completed in 1912 and 1934 (see Chapter 5, Irrigation), as well as for the foundations of the Nag' Hammadi Barrage, the Mohammed Ali barrages at the head of the Nile delta, and a number of the finer modern buildings in Cairo and Alexandria.

Porphyry.

There is much porphyry in the Eastern Desert and Sinai. Best known of the Egyptian porphyries is the so-called "Imperial Porphyry," of which Gebel Dukham, some thirty miles west of Ghardaqa is the only known source. It is a rose-colored rock flecked with white granules of plagioclase feldspar, noted for its beauty when polished. Some vessels of porphyry have come down from predynastic times, but the Gebel Dukham quarries were most intensively worked during the Roman period, when the stone was introduced into Europe. It is to be seen in many cathedrals and churches in Italy and in St. Sophia in Istanbul.

Other Igneous Rocks.

Of the other igneous rocks used by the ancients the principal ones were diorite, dolerite, gabbro, and serpentine. Diorite, which was made into vessels and was used for quarrying chisels and polished axes, has long been known to have been quarried near Aswan in antiquity, and in 1932-1933 what are now called the Cephren quarries were discovered west of the valley. This discovery is believed to have solved the mystery of the source of the diorite out of which were sculptured the beautiful statues of Cephren and Cheops now in the Cairo Museum of Antiquities. Quarrying pestles were made from a hard, greenish-black diabase quarried near Aswan and in the northern part of the Faiyum depression and called dolerite by British geologists. This diabase was also quarried at Gebel Dukham by the Romans as material for temples and other structures. The ancient dwellers of the Nile valley made vessels and other stonework out of gabbro quarried near Aswan, and the Romans quarried it in the Wadi Semna northwest of Quseir. Gabbro also occurs in association with diorite in some of the old gold-mining sites in the southeast.

Serpentine, of which an almost transparent, green variety was used for heads and figurines, is found in abundance in the Red Sea Mountains and is the principal rock in a number of mountain masses in the southern part of this range. The numerous minerals found in it, such as chromite, talc, asbestos, and magnetic iron ore, and the fact that it is easily worked suggest that it might be profitably quarried. At the present time its exploitation is mainly by local nomads who make some use of the decomposed rock for fireproof cooking vessels.

Metamorphic Rocks

Marble.

The most extensive occurrences of marble are in two localities in the Eastern Desert - at Gebel Rokham (Lat. 25°18' N., Long. 33°57' E.) and in the Wadi Dib (Lat. 27°50' N., Long. 33°00' E.) At both places there is enough stone for fairly large-scale quarrying - white marble, with some colored bands at the former, and gray marble at the latter. But what quarrying is done now is only on a very small scale. In fact, there has never been any extensive quarrying of marble except at Gebel Rokham (rokham is the Arabic word for marble), and that mainly in Graeco-Roman times. Most of the marble now used in the country is imported.

Other Metamorphic Rocks.

Of other metamorphic rocks, those which appear to have been most used by the ancient Egyptians are the black and green schists quarried in the Wadi Hammamat along the present Qena-Quseir road, green breccia from the Eastern Desert and Sinai, and slate, which is found in the Eastern Desert fairly widely distributed and in a variety of colors. None of these have been quarried in modern times.

COMMON BUILDING MATERIALS

Limestone.

Of all the building stones available in Egypt limestone has been the most used, because of the accessibility of the largest beds to the urban centers of the Nile delta and the lower valley. The limestone cliffs that border the valley have provided an abundant supply of building material from the days of pyramid building to the construction of the most recently installed Nile barrages.

The major quarrying area is in the neighborhood of Cairo in the limestone escarpment of the Eastern Desert plateau, which dominates the landscape from Helwan in the south to the Moqattam Hills east of the city. The [illegible] a stretch no more than 20 miles, a wide variety of building materials is readily at hand - limestone, gypsum, sandstone, and sand. A network of light railways connects the quarries with the valley. The most compact limestone, with the least clay and the greatest resistance to moisture, comes from the Atar el Nabi and El Basa'in quarries southeast of Old Cairo. Well suited for massive foundation and construction work, it was the principal stone used for the delta barrages and for many other barrages, weirs, and bridges there. Although the limestone is less compact north and south of these quarries it is everywhere good enough for most construction purposes.

South of the Cairo quarries, limestone has been worked in the plateau cliffs bordering the valley on the east between Asyut and Qena - mainly at Doronka southeast of Asyut in the Khazindariya quarries at Gebel Haridi opposite the town of Tahta in the Isawiya quarries east of Akhmim, and in the Qena quarries. The Isawiya limestone is of a quality comparable to the best from the Cairo quarries and provided most of the material for the valley barrages. The Qena limestone is used for making hydraulic lime and in the local pottery industry, because of its rather high content of fine marl.

North of the Cairo quarries the major quarries are in the limestone ridges that parallel the coast westward from Alexandria. The ridge between Alexandria and Lake Maryut is especially easy of access, and much of the limestone used for construction in Alexandria and other urban centers of the northern part of the delta has come from the Mex quarries in this ridge.

West of the Nile valley, where limestone occurs only in low hills, a few small quarries have been worked to the north and northwest of the pyramids

Sandstone and Sand.

The Gebel el Ahmar (Red Mountain) hills which rise a short distance east of Cairo are quarried for sandstone and sand, and the abundance of quartz sand at Abbasiya nearby has given rise to an active sand-lime brick industry there.

Basalt.

Considerable basalt is quarried at Abu Za'bal, about fifteen miles north-northeast of Cairo. East of Cairo and on the western side of the Nile valley near the pyramids and in the hills overlooking Birket Qarun, the large lake in the Faiyum depression, there are other outcrops, all easy of access.

NOTES

1. G. M. Murray, ed.: The Survey of Egypt, 1898-1948, Survey Dept. Paper No. 50, English edition, Survey of Egypt, Cairo, 1950, p. 37.

2. Major Schemes of Production, (a pamphlet in Arabic issued by the Permanent Council for the Development of National Production), Cairo, 1954, p. 61.

3. Figures from The Egyptian Economic and Political Review, Vol. 1, No. 3, November, 1954, and the Annuaire Statistique, Statistical Department, Ministry of Finance, Cairo.

4. World Oil, August 15, 1957, p. 161.

5. This figure and other figures on production in 1956 are from World Oil, op. cit., pp. 160-161.

6. Egyptian Economic and Political Review, Vol. 1, No. 7, March, 1955, p. 52.

7. World Oil, Vol. 140, No. 4, March, 1955, pp. 196-197, and Overseas Review, Barclays Bank, May, 1955, p. 44.

8. World Oil, August 15, 1957, p. 161.

9. From figures in The Egyptian Economic and Political Review, Vol. 1, No. 3, November, 1954, p. 33, and No. 7, March, 1955, p. 52.

10. National Bank of Egypt: Economic Bulletin, Vol. 10, No. 2, 1957.

11. A. Lucas: Natural Soda Deposits in Egypt, Survey Department Paper No. 22, Cairo, 1912.

12. O. H. Little and M. I. Attia: The Development of Aswan District with Notes on the Minerals of South-Eastern Egypt, Survey of Egypt, Cairo, 1943, p. 42.

13. W. F. Hume: The Distribution of Iron Ore in Egypt, Survey Department Paper No. 20, Cairo, 1909, pp. 9 and 10.

14. Little and Attia, op. cit., pp. 67-68.

9. MANUFACTURING

In the decennial census of Egypt of 1947 [1] only about ten per cent of the working population gave their occupation as some form of manufacturing, as compared with sixty per cent who registered as farmers. Moreover, more than half of the former should properly be classed as cottage-industry handicraft workers, as shown by comparing this enumeration with that of a census taken in 1952, [2] which dealt only with "industrial establishments" as distinguished from cottage industries. It enumerated 301,476 persons, as compared with the total enumeration of 666,703 in the 1947 census. Even at that, a large proportion of the 19,475 "establishments" it covered had little to distinguish them from cottage industries. More than half of them employed less than five persons each, fully eighty per cent of them less than ten each.

HANDICRAFTS

Early Development

Handicraft manufacturing is of ancient lineage in Egypt. The combination of a genial climate and fertile soil, and the protection against invasion afforded by the bordering deserts and seas favored the early development of the arts and crafts of civilization in the Nile valley and delta. Also, with agriculture mainly a matter of a single cropping following the subsidence of the annual Nile flood, there was time in plenty during the long period when the land lay fallow between harvest and the flood for making of tools and household furnishings and weaving cloth for garments. As a result, long before the dawn of history the Egyptians had learned to spin and weave, to mold pottery, to compound cosmetics and perfumes, to fashion ornaments and jewelry, and to build boats for navigation on the Nile and even to equip them with sails. [3]

With the rise of ruling families and a landowning nobility and with the founding of towns and cities, craft skills developed rapidly in response to the demand for fine dwellings and burial tombs, house furnishings, apparel, and ornaments. Long before Menes, the first king of the so-called First Dynasty, united the valley and delta in a single kingdom (about 3200 B.C.) such skills had reached an amazingly high level. [4]

By the time of the Fourth and Fifth Dynasties (2900-2625 B. C.) the Egyptian kings were dispatching fleets of vessels to Phoenicia to bring back Lebanon cedar for use in construction work and furniture making. They were at the same time importing metal, ivory, and fine woods from the Somali coast for the use of their craftsmen and artists, building the vessels for the voyage at Red Sea harbors, where they landed their cargoes and then carried them by caravan across the desert to Coptos, an ancient city and commercial center on the site of the present town of Kuft (or Qift). There is archeological evidence, also, of trade with the Aegean Islands at this time. [5] Trade with Arabia and other countries of southwest Asia had early beginnings; by 2000 B.C. a lively commerce was being carried on between them and the towns of the Nile valley by way of a canal that had been dug from the Gulf of Suez to the Wadi Humilat, the easternmost of the delta channels, along much of the route now followed by Ismailiya Canal

(see Chapter 11, The Suez Canal). While, for the most part, the products of the craft shops of the time went to fill local orders and to supply the local trade, there is evidence that certain of them, as well as agricultural products, were carried on the outward voyages of the royal fleets at an early date.

The Decadence

Until the end of what is known as the New Kingdom (about 1085 B.C.) Egypt was almost continuously independent, whoever might hold the reins of power. There were, it is true, rulers and successions of rulers who were weak and let local government slip out of their hands, with the result that the irrigation of the land, on which the prosperity of the country mainly depended, was disastrously neglected. Poverty was then widespread, craftsmanship languished, and commerce declined practically to the vanishing point. But as long as Egypt was independent, such periods of disintegration were followed by periods when the rulers were once again strong and the arts and crafts flourished and commerce revived. However, from the end of the New Kingdom to the conquest of the country by Alexander in 332 B.C. and his founding of the port city of Alexandria (the period is known as The Decadence), Egypt was torn by a succession of invasions which all but stifled any creative effort.

The Ptolemaic and Roman Periods

Alexandria soon came to be, and long continued, the chief entrepôt between the East and the West. As such it was shortly teeming with foreign merchants, and craftsmen, foreign as well as Egyptian, found there an opulent market for their products. In fact, for the first one hundred and fifty years of the reign of the Ptolemies, the whole country prospered, as irrigation and drainage were improved and much new land brought under cultivation. But from then on until 30 B.C., Octavian made Egypt a province of Rome, rivalry and feuds in the royal family brought economic depression and cultural decline once more.

Rome's principal interest in Egypt was as a supplier of grain and other agricultural products. With irrigation works that had fallen into disrepair restored and extended and new land brought under cultivation, Egypt soon earned the title of "granary of Rome," as the richest agricultural province of the empire. But the Egyptians themselves profited not at all from this prosperity, and the Roman rulers had no interest in reviving the traditional skills of the Egyptian craftsmen.

The Fatimite Period

In fact, not until the period between the Arab invasion in 639 and the Turkish conquest in 1517 did workshop manufacturing thrive once more. It throve particularly during the prosperous years of Fatimite rule (969-1171 A.D.). The Arabs added sugar making to the traditional skills of the Egyptian craftsmen, and the introduction of Egyptian sugar into Europe first awakened Britain and France to the rich agricultural potentialities

of the Nile valley and delta.

Of the handicraft industries revived during the Fatimite period, textile weaving, pottery making, furniture construction and other woodworking, and inlay work were especially important. These and other industries came to be well organized in the hands of closed groups of specialists, not unlike the guilds of Europe, and were handed down from generation to generation. Many of them, in spite of numerous periods of almost complete political and economic disruption, have been so handed down to the present time. No small number of them are, for this reason, still able to hold their own in the local market in competition with modern factory-made products.

A characteristic of the handicraft industries in Fatimite times was their concentration in certain sections of towns and cities, some of which, such as Cairo, Damietta, Akhmin, and Qena, are still noted abroad as well as in the home market for their products. Certain districts of Cairo are, for example, colorfully suggestive of the period. Different alleys there are known today for certain traditional crafts - copper working, inlay work, jewelry making, joinery, leather work, rug and carpet weaving, smithing, tent making, textile weaving - and in many cases are named after them.

Prosperity and Deterioration under the Mamelukes

Economic deterioration, with all its usual effects, set in again in the latter years of Fatimite rule, but a degree of prosperity returned under the early Mamelukes (1250-1380 A.D.). Irrigation works, which had fallen into serious disrepair, were restored and extended. Commerce with southern Arabia and India flourished and with the revenues derived from it, architectural and artistic production was encouraged and handicraft manufacturing experienced a corresponding revival.

The extravagance of the Mamelukes, however, finally drained the public treasury and brought the economy of the country once more to a disastrously low level, and the manufacturing industry suffered accordingly. After the circumnavigation of Africa by the Portuguese in 1498, Alexandria had to yield the position it had held for more than a thousand years as the focus of East-West trade, and the discovery of America turned European attention to new sources of wealth and new avenues of trade. This combination of circumstances and the conquest of the country by the Ottoman Turks in 1517 marked the beginning of a Dark Age for Egypt that was to continue until the accession of Mohammed Ali as Governor-General in 1806.

Egypt knew only poverty under Turkish rule, for there was now no longer any possibility of the encouragement of the arts and crafts and of the adventures in foreign commerce by which many of its earlier rulers had given the country periods of great prosperity. The Sultan's whole interest in Egypt was as a source of revenue for his own treasury. The functions of the pasha who represented him in Cairo were little more than those of chief collector of the exorbitant taxes he levied. Internal administration was still in the hands

Manufacturing under Mohammed Ali was his own monopoly, as was, in fact, the whole economy of the country. Mechanized factories were built to replace old craft industries and were directed by his officers. Missions were sent abroad to learn up-to-date manufacturing techniques, and machinery, fuel, raw materials, and technicians were imported.

The whole new industrial economy revolved around Mohammed Ali's ambition to make Egypt an economically self-sufficient, powerful state to establish an Egyptian empire in northeast Africa and southwest Asia. The result was a too-strenuous drive which overtaxed the country's resources and finances, so that, as his political strength waned, most of the industries he had started collapsed. But the collapse was also partly due to outside forces. A combination of foreign powers ended Mohammed Ali's hope of creating an empire and enforced restrictions on his military strength. A commercial treaty, signed between Great Britain and Turkey in 1838 and made applicable to Egypt by the Treaty of London of 1840, opened the Egyptian market to foreign manufactures with which local industry could not compete.

Ismail's Extravagance and British Intervention

Once again under Ismail, Mohammed Ali's grandson, who ruled as Governor-General from 1863 to 1867 and as Viceroy (Khedive) from then on until he was replaced by his son Tewfik in 1879, a bold attempt was made at industrial development. Ismail's extravagant and recklessly promoted program included railway expansion and harbor improvements, the completion of the Suez Canal, the development of the sugar industry, and the digging of the great Ibrahimiya Canal to water his sugar plantations. But although all this was beneficial in the long run, it bankrupted the country and obliged it to submit to the British occupation for forty years (from 1882 to 1922, when Great Britain declared the country's independence). Not until eight years later, when the last of the commercial treaties which Egypt inherited from Turkey had expired, did the country begin to protect its industry against the influx of foreign manufactures.

From the beginning of the British occupation until about 1930, Egypt's whole economy was geared almost exclusively to getting the greatest possible amount of land under year-round irrigation and getting the largest possible yield of crops for which there was a demand in the foreign market. Furthermore, though the British deserve much credit for rescuing Egypt from the financial morass in which they found it and for the development of its present remarkable irrigation system, they by no means favored a local spinning and weaving industry that would reduce the flow of high-grade cotton to the mills of Lancashire or compete with imports from them. Nor were they, in fact, inclined to encourage the development of any other manufacturing to a point where its products would compete in the local market with imports from British factories.

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As a result, there was no legislation until the 1930's even for such elementary matters as the regulation of trademarks and patents. Protective tariffs were put into effect as soon as the commercial treaties had expired, but only recently have any other material advances been made in industrial legislation, and only since World War II has there been any progress in labor legislation. Anything in the way of a systematic levy of taxes on industrial and commercial enterprises is also of recent introduction, and much still remains to be done before legislative measures dealing with the organization and control of industrial enterprises are on a par with those dealing with agriculture.

MODERN INDUSTRY TODAY

Deterrent Factors

Agriculture the Basic Economy.

Quite apart from the obstructions that the British may have put in the path of industrial development, a number of other factors have been scarcely less important as deterrents to modern, mechanized industrial development. Chief among these is the fact that the economy of the country has always been, and in the present age is more than ever before, based primarily on the productivity of its agricultural land. Egypt has no coal, only recently been found to have substantial petroleum resources, and for lack of these, has had no means of profitably exploiting the only metal of which it is known to have enough to provide the raw material for a metallurgical industry on any large scale - the Aswan iron deposits.

Lack of Raw Materials, Fuel, and Power.

In certain of its agricultural products - its cotton, sugar cane, oil seeds, hides, fruit, and vegetables - and in its extensive deposits of limestone and phosphates, the country does have the basis for the development of light industries on a scale that would contribute substantially to the solution of its problem of overpopulation and eventually lead to a higher standard of living for all its people. Considerable progress has been made in that direction in recent years, but the handicap of fuel and power shortage still remains to be surmounted. Petroleum production in any significant quantities dates only as far back as the opening of World War II, and in spite of steady increases from recently discovered additional sources, the local output is still far short of even the present requirements for manufacturing and transport purposes. Strangely enough, it is only recently that any definite steps have been taken to capitalize on the hydroelectrical potentialities of the Aswan Dam and the Nile barrages. Two power plants now under construction at the Aswan Dam will do much to relieve the present power shortage, especially if it is found that power from them can be efficiently transmitted to downriver and industrial centers. If the high dam now proposed for construction a short distance above the Aswan Dam is built, the powerful generators included in the plans for it should effect a real industrial revolution.

Inadequate Home Market.

In addition to these physical handicaps, and probably as much to be reckoned with, are a number of human circumstances which must be taken into account in any analysis of the retardation of factory manufacturing in Egypt. One is that for many years the crop area per capita has been steadily decreasing with the natural increase in the population. The result has been a steady decline in the domestic market for manufactured goods, so far as a large proportion of the population is concerned. What little the small farmers, whose families make up the great mass of the population, may have to sell or barter is barely sufficient to pay for their minimum purchase requirements, and these are mainly satisfied by handicraft products made in their own villages or in nearby towns.

This limitation of the local market, perhaps more than anything else, has discouraged investment in industry, and especially the much-needed investment of foreign capital. Foreign investment has been largely in public utilities, land and land reclamation, and trade.

Shortage of Capital.

Local capital for investment in industrial enterprise is extremely limited. This, too, is at least as much the result of custom and tradition as it is of actual shortage of funds. Obviously, the farmers have no surplus for bank saving or investment in industrial enterprises. But to Egyptians with money to invest, the purchase of land, whether already under cultivation or open to reclamation, has had the greatest appeal ever since private ownership of land has been permitted, and land is still considered as offering much greater security than does industrial investment. Moreover, with the increase in the small-farmer and farm-laborer population, which knows and has no means of making a living except from the land, land prices are ever rising. However high the price, land has, consequently, continued to be a profitable investment, since the landowner has been free to capitalize on every rise by raising the rent rates to his tenants.

Coupled with the propensity to invest in land there has also been a deep-rooted aversion that seems due in part, at least, to the Islamic prohibition of gambling. This aversion is against bank savings, buying insurance, investing in local industrial stocks and bonds, engaging in business transactions without social connotation, or taking advantage of any of the other avenues to which people elsewhere turn for the investment of their surplus capital, and this has precluded the growth of much in the way of credit facilities for starting new industries or expanding old ones.

Fully as much to release money for industrial investment as to provide more land for the small farmer has the present government made the enforced sale of land a major item in its program.

The Skilled-Labor Shortage.

Finally, the shortage of skilled labor and of persons experienced in industrial management, such as one might expect in a traditionally agricultural country, has also been a serious deterrent to industrial development,

and still is, although the situation has been remedied to some extent through government efforts during the past thirty years to promote technical education and training in the trades. There was also considerable improvement in this respect through the experience gained during World War II, when thousands were employed by the Allied forces in various types of manufacturing and repair.

The Commercial Treaties.

That the industrial revolution in Egypt, with its limited effects, was so late in starting can, however, by no means be attributed entirely to local conditions and attitudes and British opposition or failure to afford it any support. For many years before 1930 Egypt was hamstrung by commercial treaties with all the great powers (including the United States) and with a number of lesser ones. Most of these were derived from the so-called capitulations inherited from Turkey. These capitulations, the first of which was granted by the Sultan to France in 1535, were in themselves a sufficient burden on the country, since they afforded special privileges to citizens of the countries to which they were granted who were resident in Egypt, however briefly. No direct tax (income tax, inheritance tax, duty on commercial transactions, and the like) could be levied on such persons, except with the consent of all the capitulation countries. The right of the Egyptian government to impose customs duties was originally specified as not to be affected by the capitulations. However, not only was it an easy matter so to apply the capitulations as to impinge on this right, but out of them grew commercial treaties with the capitulation powers and an agreement by which all import duties were fixed at eight per cent ad valorem.

No distinction was made in this tariff agreement between manufactured articles and raw materials and fuel. The effect of so low a tariff on manufactured goods was the influx of numerous items at prices with which local manufacturers could not hope to compete. The effect of so high a tariff on raw materials and fuel was equally obstructive. Coal and petroleum, for example, both greatly needed if there was to be any industrial development at all, paid the same duty as manufactured goods.

World War I and the National Awakening

Important shortages during World War I and the demand created by the presence in the country of large Allied forces led to the opening of a number of small manufacturing plants, and older ones found it profitable to increase their output. There was no prospect for real progress in industrial development, however, until 1930, when the last of the commercial treaties with their "most favored nations" clauses, expired. Nevertheless, the brief wartime prosperity had served a good purpose. It had awakened official Egypt, of which the higher echelons were at that time mainly representative of the class of great landlords, in whose hands the wealth of the country is largely concentrated, to the country's potentialities for industrialization. It had also brought to official Egypt some appreciation of how much the country as a whole benefit if, for an economy based on the export of agricultural raw materials and the importation of manufactured goods, there could be substituted one in which

a full effort was made to satisfy with local manufactures the local demand for such goods as could be produced from local raw materials.

The result was the appointment in 1916 of a Commission on Commerce and Industry to study the situation, the creation in 1920 in the Ministry of Finance of a department (now Ministry) of Commerce and Industry, and the founding in 1922 of a Federation of Industries. The report of the Commission, issued in 1917, focused attention on the significance of industrialization as a step toward sound economy and a remedy for the country's already grave problem of overpopulation.

The Bank Misr.

Most important, perhaps, of all the steps taken in this period of newly aroused interest in industrialization was the founding in 1920 of the Bank Misr, the first Egyptian bank financed entirely with Egyptian capital and since its beginning managed and staffed exclusively by Egyptians. It was founded principally to assist existing industrial and commercial enterprises and to foster the organization of new ones. In pursuit of the latter purpose it had, within twenty-five years of its founding, organized and in some cases financed joint stock companies for a wide variety of manufacturing and commercial activities, all more or less affiliated and all bearing the name Misr.

The purposes and founding dates of the more important of the Misr companies are: printing (1922), cotton ginning (1924), transport and navigation (1925), cotton spinning and weaving (1927), linen spinning and weaving (1927)silk weaving (1927), fishing (1927), cotton export (1930), aviation (1932), shipping (1934), insurance (1934), vegetable-oil extraction (1938), fine cotton spinning and weaving (1938), mining and quarrying (1938), manufacture of pharmaceutics (1940), rayon manufacture (1946). The Misr enterprises now give employment to nearly 50, 000 persons. A number of their plants compare well in equipment and operation with the most modern establishments of their kind elsewhere. The total paid-up capital of the Misr companies is now somewhat more than £E 7, 000, 000 (about $20, 000, 000) as compared to £E 2, 300, 000 at the opening of World War II. The Bank Misr itself, which opened with a nominal capital of £E 80,000, now represents a capital investment of £E 2, 000, 000 (nearly $6, 000, 000).

Government Action After Independence

Great Britain's ending of the Protectorate and the declaration of Egypt's independence in 1922 did not leave the country free to take whatever steps it chose toward industrial development. Not only were a number of the commercial treaties still unexpired and the capitulations still in full force, but the Declaration of Independence specified that certain matters were to be left for discussion and agreement at some later date and until then were to remain in the status quo. Among these was the protection of foreign interests, by which was implied the continuation of foreign domination of the Egyptian market for manufactured goods.

Complete independence and freedom of action did not come until the Anglo-Egyptian Treaty of Alliance was signed in 1936 and the worst features of the capitulations (the legislative and fiscal immunity of foreigners) were abrogated by agreement of the capitulation powers in the Montreux Convention of 1937.

Tariff Reform and Direct Government Aid.

Nevertheless, the date of the turning point in Egypt's industrial development may properly be said to be February 16, 1930, when the last of the commercial treaties, that with Italy, expired. The government had ready a tariff reform measure drafted by a committee of foreign experts engaged for the purpose in 1927, and in command at last of its own tariff policy, put it into effect the very next day after the expiration of the treaty. The reforms were designed specifically to encourage and protect local manufacturing. High duties, in many cases practically prohibitive, were imposed on imports of products considered competitive with local products or for which the prospects for local manufacture seemed good. Duties on numerous raw materials were at the same time greatly reduced, although there were still many which, for revenue purposes, remained heavily taxed.

The protection thus afforded to industry had an almost immediate effect, as is reflected by the increase in imports of raw material and machinery and decrease in those of manufactured goods in 1938 as compared with 1913, shown in Table 1.[6] According to a census of manufacturing establishments taken by the government in 1937, sixty per cent of

Table 1 - 1938 Imports as Percentage of 1913 Imports

Raw material and machinery	Percentage	Manufactures	Percentage
Mineral oils and lubricants	1403	Iron bedsteads (value)	2
		Leather shoes	6
Silk yarn	1012	Furniture (value)	11
Precision instruments	629	Fezes	13
Heavy fuel oil	590	Tanned leather	22
Vegetable oils for industry	516	Cement	24
		Cotton yarn	29
Iron bars	331	Matches (value)	40
Machines (value)	313	Glassware	45
Cast iron	281	Soap	51
Woolen yarn	180	Cotton piece goods	58

the total number enumerated at that time were reported as dating only from the period 1928 to 1937. [7]

In addition to affording protection by the tariff reform, the government, once free of outside interference, also began to grant loans to manufacturing industries, notably to manufacturers of textiles, tobacco products, chemicals, glass, and metal products. Excise taxes, levied for revenue on many local products, were also eased, or completely lifted in a number of instances, as were quay dues on exports. But the present status of industrialization is mainly to be credited to the original tariff reform and to numerous subsequent adjustments of the tariff. The tariff policy, however, in many cases has meant the development of a particular industry at high cost to the local consumer. For example, the price of locally-produced sugar has been up to £E 12 per ton when the world price was only £E 6. Nor has the manufacturer always actually profited. Although the duty on cotton textiles has at times been doubled to protect the cotton spinning and weaving industry, a prohibitive tariff imposed on raw-cotton imports at the same time has forced the industry, in order to make the low-quality goods that are in greatest demand in the local market, to use high-quality Egyptian cotton which would otherwise have been exported. [8]

World War II Prosperity and After

As has been pointed out, World War II gave new impetus to industrialization. During much of the North African campaign Egypt was a strategic base for the Allied forces. The prosperity they brought meant greatly augmented demands for certain supplies that could be furnished only by local industry. Also, in the Middle East the difficulty of getting supplies from other sources greatly increased the demand for Egyptian products. Hence many of the local industries expanded and diversified their output, many new enterprises were founded, and a greatly enlarged trade with the Middle East opened Egyptian eyes to the marketing possibilities there. Scarcely less important, of some 300,000 Egyptians who were employed by the Allied forces, many gained technical training and experience in manufacturing and repair work and in the servicing and maintenance of equipment.

The aftermath was quite different from that of World War I. Local consumers had become more accustomed to local manufactures, a greater variety of products was available, and the quality of many items had been improved so that they could compete successfully with imported products. Moreover, many industrial organizations had profited greatly from the rise in prices which accompanied the increased demand for their products, and hence, for the first time in the history of Egyptian industry, possessed reserve funds that they could use for further expansion, modernization of their equipment, and even for new ventures.

Consequently, no such decline in industrial activity ensued as that which followed the brief period of prosperity during World War I. Instead, many industries continued to expand and a number of new ones

were founded. The manufacture of textiles, rayon, plastics, chemical fertilizers, rubber goods, pharmaceutics, and steel castings, and refrigeration were among the more important enterprises involved in this new development. During the three-year period immediately after the end of the war more than a hundred new stock companies, with a total capital of upwards of £E 20,000,000, were formed. Various concessions offered by the government also brought in a number of branches of foreign companies with a view both to satisfying the demand for certain commodities that local manufacturers could not duplicate and at the same time to providing additional employment for local labor - among them automobile assembly plants and plants for the manufacture of toilet soap, electrical fixtures, and soft drinks.

In response to this surge in industrial activity the government proceeded to put into effect certain long-needed measures designed to promote the organization of industrial companies and to assist them with credit facilities. The most important of these measures were the enactment of a Companies Law in 1947 and in 1949 the foundation of an Industrial Bank in which 51 per cent of the shares were government owned.

<u>The Companies Law.</u>

The Companies Law was directed explicitly toward promoting investment of Egyptian capital in local enterprises and ensuring participation by Egyptians in their management and labor force. So designed as to cover not only all companies organized for manufacturing but companies engaged in commerce and trade, land companies, and financial corporations, it specified minimun requirements of Egyptian representation in shareholding, management, and employment in them.

The principal provisions of the law were (1) that, in any company, no less than 40 per cent of the members of its board of directors, 75 per cent of its salaried employees, and 90 per cent of its labor staff must be Egyptians, and (2) that, in forming new companies or increasing the capital of existing companies, 51 per cent of the shares must be reserved for Egyptian investors. The law further provided that salaries paid to Egyptians in any company must amount to at least 65 per cent of the salary total, and wages paid to Egyptians to 80 per cent of the wage total. (A three-year period of grace was allowed for existing companies to adjust the percentages in these categories to conform with the law, and companies operating on a concession basis were exempt until such time as the concessions expired.)

The law also included certain safeguards against political and monopoly influence. No salaried government official was permitted to participate in the management of a company or serve on its board of directors, and no former cabinet minister or head of a department in a department in a ministry could act in either of these capacities until three years after the date of his severance from his post. No one could be a member of the boards of directors of more than ten companies at the same time nor be an executive of more than two companies.

Beneficial to the development of Egyptian industry by Egyptians as the Companies Law may have appeared to its sponsors, it served to inhibit rather than to promote industrial development. As already explained, wealthy Egyptians are reluctant to invest in anything but land when making investments in their own country; but the amount of Egyptian capital that would be available, even if there were no more land to buy and investment abroad were prohibited, would be too limited to finance a large-scale industrial development, unaided by funds from outside. Coupled with the shortage of technicians and skilled workers and of personnel experienced in industrial management, this shortage of capital means that foreign capital is needed and to a very considerable extent for some time to come foreign technical knowledge and skill as well, if industry is to be so developed as to provide employment for the country's labor surplus and substantially to increase the national income. The restrictions and limitations imposed by the law are serious obstacles in the way of obtaining both of these needed forms of foreign participation.

Reforms and Projects under the Present Government

Of the reforms instituted by the new government after the revolution of July, 1952, none would seem to be more important for the development of industry than those incorporated in the new Companies Law enacted in February, 1954.* While the provisions of the old law with respect to Egyptian representation were retained in a general way, they were so modified as greatly to improve the chances for investment of foreign capital. The minimum of 51 per cent of the shares of new companies required to be reserved for Egyptians in the 1947 law was reduced to 49 per cent, and these shares were required to be held for Egyptian subscribers for one month only, after which subscription could be opened to foreigners and Egyptians alike. Also, these provisions applied only to companies incorporated in Egypt and not to companies incorporated elsewhere. In companies capitalized at £E 20,000 (about $57,500) or more, the minimum nominal value of the shares was reduced from the £E 4 required by the 1947 law to £E 2. Although the number of boards of directors of which a person might be a member was reduced from ten to six, this regulation did not apply to membership on boards of companies that had been in existence for less than five years nor to those of companies in which the person in question owned ten per cent or more of the stock. The law also laid down detailed regulations with respect to the duties and remuneration of members of boards of directors, distribution of profits, rights of stockholders at general stockholders' meetings, and the duties and responsibilities of auditors.

In 1954 the customs regulations were again revised. Prohibitive duties were imposed on imports that were in direct competition with locally manufactured products. Duties were also raised on certain articles

*What follows on measures taken by the present government to promote industrial development has to do with the period before the nationalization of the Suez Canal and before the reported steps to eliminate managerial participation by foreigners in Egypt's industry and finances.

of which it was felt that the local manufacture should be encouraged, were reduced on manufactured parts imported for assembly in local plants, and were radically reduced or completely abolished on certain raw materials and articles and capital goods needed by local industries.

Before the enactment of the new Companies Law and the revision of the tariff regulations a number of steps to encourage local industry had already been taken. A Permanent Council for the Development of National Production was created very shortly after the 1952 revolution and given broad powers to formulate, finance, and implement programs for economic development. It has concerned itself largely with plans for the introduction of new industries and for expanding and improving those already in operation. In a tax law enacted in 1953 new joint stock companies organized for manufacturing, mining, land reclamation, and entertainment were exempted from taxes on profits and movable properties for a seven-year period, and long-established companies were relieved of half the normal tax on such profits as they might reinvest in their own enterprises.[9]

Finally, a law was passed in 1953 requiring that Industrial Chambers be formed in all categories of industry and that every industrial company with a capital of £E 10,000 (about $29,000) or more must join one of them. (This minimum may be further reduced by decision of the Minister of Commerce and Industry.) These chambers are authorized to establish funds to be used in the development of the industries they represent and to raise such funds by levies on their adhering companies. The law also calls for the revival of the Federation of Industries originally founded in 1922 and requires that all Industrial Chambers must join it and that the member companies of these chambers must make available to it all data respecting their activities.

In addition to legislative measures and tariff revision, the new government took further direct steps to promote industrial development. It sought to provide for the allocation of funds to assist existing industries in improving the quality of their products and in marketing them, and it participated to a considerable degree in the financing of new industries. In the 1954-1955 budget it allocated £E 35,000,000 (about $90,000,000) for the latter purpose, and it subscribed 25 per cent of the initial capital of £E 2,000,000 for a new bank, the Egyptian Republic Bank, founded in February, 1955, to conduct a normal banking business in branches throughout the country. With a view to improving the home market for local manufactures and the accumulation of funds in the hands of small farmers and factory workers for investment in local industry, plans were made to educate them to save through postal savings banks and through rural thrift societies and other cooperative organizations.

THE PRESENT INDUSTRIAL PLANT

Persons Engaged in Industry

Just over 300,000 persons were engaged in the manufacturing industry in Egypt in 1951, as shown in Table 3.[10] They constituted a little less than

1.5 per cent of the total population as compared to nearly eight per cent in the United States that year. Of them 85.3 were wage earners, 8.7 per cent salaried employees (managers, foremen, and the like), and six per cent executives (proprietors or their agents). Cotton gins and textile mills are the largest employers, accounting for about 35 per cent of the total industrial population in 1951. The processing of food, beverages, and tobacco engaged 30 per cent. Metal and machine works employed 6.5 per cent. The total outlay in wages and salaries that year was £E 25,264,000 (about $73,000,000), of which 70.8 per cent was paid to wage earners, 21.7 to salaried employees, and 7.5 to executives.

Many industries employ children, notably the handicraft industries and cotton ginning. In 1951 nearly 30,000 industrial employees (ten per cent of the total) were under fifteen years of age. Approximately 12,000 women were employed (4 per cent of the total), mainly in cotton ginneries, knitting mills, clothing factories, and the cordage and straw weaving industries.

The shortage of native skilled labor and personnel experienced in management is reflected in the number of foreigners employed - 7301 in 1951. In general, since they were mainly employed because of special skills, they commanded higher wages and salaries than did Egyptian employees. Although foreigners constituted less than one per cent of the total number of wage earners in 1951, they received 2.7 per cent of the wages paid; the 15.6 per cent of the salaried employees who were foreigners received 26.7 per cent of the salaries paid in this employment category; and the 4.2 per cent of the executives who were foreigners received 12.6 per cent of the salaries paid to this group.

Wages in industry are low, as shown in Table 2.

Table 2 - Average Weekly Wage (in £ E)*

Industry	1st week, July, 1949	1st week, July, 1950	1st week, July, 1951
Transport equipment	2.27	3.42	2.64
Beverages	1.42	1.72	1.82
Printing	1.62	1.81	1.80
Textiles	1.09	1.32	1.77
Chemicals	1.56	1.45	1.76
Basic metals	0.81	2.43	1.74
Leather	1.38	1.70	1.71
Cement, glass, pottery, etc.	1.59	1.76	1.68
Food processing	1.21	1.36	1.64
Tobacco	1.83	1.52	1.59
Woodworking	1.40	1.60	1.57
Machinery	1.39	1.83	1.52
Paper	1.16	1.32	1.35
Metal products	1.40	1.42	1.33
Petroleum refining	5.13	----	4.68

*One Egyptian pound (£E) is valued at $2.87 at the current rate of exchange.

Table 3 - Manufacturing Industries, 1951

(Production Costs and Value of Output in £E 1000's)

Industry	Number of establishments	Persons engaged	Salaries and wages	Cost of raw materials	Cost of fuel and power	Value of output	Value added
Textiles	5, 192	91, 326	7, 774	46, 884	1, 782	68, 063	19, 397
Cotton ginning and baling	90	19, 185	1, 273	24, 063	243	28, 510	4, 204
Clothing	1, 031	4, 249	511	1, 742	32	2, 762	989
Food	5, 654	72, 259	5, 253	61, 563	3, 076	82, 149	17, 510
Beverages and alcohol	284	9, 355	825	3, 000	184	6, 941	3, 757
Tobacco	51	10, 994	1, 196	31, 152	24	35, 118	3, 942
Woodworking	1, 788	9, 506	759	1, 516	33	2, 979	1, 429
Leather	1, 861	9, 447	718	3, 061	34	4, 433	1, 338
Rubber	5	994	150	395	18	714	300
Cement, glass, pottery, etc.	997	19, 627	1, 626	2, 093	1, 623	8, 673	4, 958
Paper	144	5, 398	392	1, 209	41	1, 982	732
Printing	346	10, 113	1, 210	1, 969	98	4, 280	2, 214
Chemicals	302	7, 620	650	4, 887	160	7, 761	2, 714
Basic metals	134	4, 658	565	8, 853	180	10, 339	1, 306
Machinery and supplies	63	3, 163	348	269	19	702	414
Transport equipment	60	2, 967	432	401	7	1, 238	830
Other metal products	1, 184	12, 288	924	2, 329	130	4, 084	1, 625
Petroleum refining	2	1, 907	281	1, 624	80	3, 844	2, 140
Other miscellaneous	287	2, 162	377	2, 474	68	3, 590	1, 048
Totals	19, 475	301, 467	25, 264	199, 484	7, 832	278, 162	70,947

In 1951, the average, except in the oil refineries, amounted to only £E 1.71 ($4.91) for a week of fifty hours. The higher average weekly wage in the oil refineries, £E 4.68 ($13.44), is due to the larger proportion of skilled labor required there than in most other industries.

Value of Industrial Output and Cost of Manufacture

As shown in Table 3, the total value of all manufactured goods produced in 1951 was £E 278,162,000 (about $798,800,000). This was more than half the estimated value of agricultural production that year (£E 487,800,000; $1,390,750,000)[11] and works out to about £E 13.6 ($39.00) per capita of the population as compared to nearly $500 per capita in the United States that year. Two-thirds of this value came from textile manufacturing and food and tobacco processing. Cotton ginning and baling rank fourth among the various manufacturing groups in value of product but do not rate that position from the standpoint of the value added by manufacture (a mere two per cent) to the value of the raw material.

Of the total cost of production, which amounted to £E 232,581,000 in 1951, only about 11 per cent was for wages and salaries and 3.4 per cent for fuel and power. The more important branches of Egypt's present manufacturing use raw materials the processing of which requires comparatively little fuel or power. They are also mainly local products; of the major industries only tobacco processing calls for imported raw materials to any appreciable extent.

Fuel and Power

In 1951, 18,331 engines and electric motors were used in manufacturing, with a total horsepower of 1,286,027. The majority were small-powered motors - 14,569, with a combined horsepower of 888,602. Oil engines furnished only 22 per cent of the power used and steam engines about ten per cent.

The largest users of electric motors were the textile mills and clothing factories, which operated almost exclusively with electrical power, using 45 per cent of the motors and nearly 60 per cent of the power generated. The second largest consumers of electrical power were the various plants manufacturing metal products, including machinery and electrical appliances and supplies. The 302,545 horsepower used by these in 1951 (23.5 per cent of the total) was more than 99 per cent electrically generated.

Other relatively large users of power were the various branches of the food-processing industry. More than 70 per cent of the total of 208,717 horsepower used by these was direct power furnished by oil or steam engines, as was most of the power used in cotton ginning and baling.

Only very limited use is made of windmills and water wheels and that almost exclusively for grinding grain (windmills, mainly) and crushing sugar cane (windmills and a few water wheels). In 1951 they supplied together a little more than one per cent of the power used in grinding grain and about twenty per cent of that used in crushing cane.[12]

PRINCIPAL MANUFACTURING INDUSTRIES

The Textile Industries

Cotton Spinning and Weaving.

Cotton, Egypt's most important commercial crop, provides the raw material for the most important branch of the country's textile industry and contributes about 85 per cent of the value of its exports.

The ginning of the cotton crop, although not properly a branch of the local cotton textile industry, is a substantial business in itself. The total capital of £E 3,500,000 (about $10,000,000) invested in it is almost a sixth of the total investment in the textile industry. Every one of the country's present 86 ginneries is capitalized at £E 2000 or more, and 76 of them at £E 10,000 (about $29,000) or more. Although the largest ginning centers are at Kafr el Zaiyat and Mansura in the delta, and Minya in the valley, ginneries are conveniently located in most of the larger towns, except in Qena and Asyut provinces - 55 of them in the delta and the remainder in the valley. Except for the government owned ginnery at Sakha, the entire ginning business is privately owned - mainly by joint stock companies, but in a few instances by individuals. A ginning company of the Misr group of enterprises handles fifteen per cent of the crop.

The local spinning and weaving mills now take between fifteen and twenty per cent of the annual cotton crop. Although their product rates, generally, only from poor to average in quality and is of narrow range as to variety, it now meets more than ninety per cent of the local demand. The mill of the Misr Company for Fine Spinning and Weaving, put into operation at Kafr el Dauwer (Beheira province) in 1938, is equipped for weaving high-quality fabrics, but its production is small. What demand there is for goods of better types than those that come from it and other local mills is supplied largely by imports.

Considerable hand spinning and weaving on hand looms and in small mills is still done, but the production of the larger mills accounts for 55 to 60 per cent of the total output of cotton yarn and for 75 to 80 per cent of that of the woven fabrics.

About eighty per cent of the cotton used in the local mills is the short-staple variety, mainly Ashmuni and Zagora; the larger mills use, usually, the medium grades, and the small mills and hand-loom operators the poorer grades. Practically all the long-staple cotton grown and the best grades of the short staple are exported. (See Chapter 6, Cotton and Other Fiber Crops.) Some yarn is also exported - 11,180 tons in 1954.

The leading spinning and weaving establishments are those of two companies of the Misr group, one at El Mahalla el Kubra (Gharbiya province) and the other the Kafr el Dauwer mill, mentioned above. The mills of the Misr Company for Cotton Spinning and Weaving, which began operations at El Mahalla el Kubra in 1927, now form the country's largest manufacturing establishment. With around 150,000 spindles and 4000 looms, they have

somewhat more than a third of the country's mechanized spinning and weaving equipment. Their production of 19,000 tons of yarn and 100,000,000 square meters of cloth in 1954 was 32.3 and 42.8 per cent, respectively, of the country's total production of these two items. [13]

The town of El Mahalla el Kubra was long one of the main centers of the hand-loom industry. Here hundreds of small workshops drew their raw material from the cotton growing districts in the heart of the delta and from them the Misr company recruited its skilled workers. Its mills now employ some 16,000 persons, for whom and for the workers in its associated mills and factories the company has created a model workers' town, with well-equipped cottages, cafeterias, recreation rooms, playing fields, and social educational, and medical services.

The company is steadily improving its operation methods and increasing the amount and variety of its products. Recently it has expanded to include modern equipment for dyeing and printing cotton cloth and departments for weaving flannelette, woolen cloth, and hosiery.

Among the other large cotton-milling concerns the most important are the Spahi Industrial Company for Yarns and Textiles near Cairo, and the National Spinning Company of Egypt at Alexandria. The latter is the oldest of the country's large textile mills. It was established in 1899 as the Anglo-Egyptian Company for Spinning and Weaving and was reorganized under its present name in 1911.

There are also thousands of small mills and hand-loom workshops, which contribute nearly twenty per cent of the annual output of woven fabrics. Well over two thousand of them represent less than £E 50 (about $144) of capital investment each. Cairo has a great many, but they are to be found in practically all the principal towns, and particularly Qalub, Minuf, Shibin el Kom, Mit Ghamar, Bilbeis, Damietta, and Fuwa in the delta, and Giza, Sinnuris, Asyut, Abutiq, Akmin, and Qena in the valley.

The government's efforts in the past to promote industrial development have been concerned mainly with the cotton spinning and weaving industry and have consisted chiefly of imposing heavy duties on imports of competitive goods. Under the present government a number of radical changes have been made in the procedures for buying and selling and pricing the raw-cotton supply, with a view to affording the industry a measure of stability that it has never experienced before. To eliminate the wide price fluctuations which have been the bane of both exporters and the local industry, the Alexandria Futures Market has been subjected to regulation and a Cotton Commission has been created and empowered to buy all cotton from the growers at fixed, reasonable prices and sell it in accordance with a system of prices based on New York quotations. To provide financial assistance in expanding the industry, improving its products, and promoting their sale both at home and abroad, a Cotton Spinning and Weaving Industry Assistance Fund was established in 1953 and placed under the administration of the Federation of Industries.

Rayon and Silk.

The weaving of rayon fabrics has shown considerable growth since World War II, while that of silk has been steadily declining. The production of both falls far short of the demand of the local market. The annual production of rayon fabric averaged only around 3000 tons for several years preceding 1954, and supplementary imports amounted to about 1000 tons. But in 1954, 4135 tons were produced, and imports fell off correspondingly. All yarn for the rayon industry was imported until 1946, when the Misr Rayon Company opened a mill at Kafr el Dauwer for the manufacture of rayon yarn. The new mill was soon turning out around 2500 tons of yarn a year, with the result that imports were reduced to nearly that amount. In 1954, its production was up to 3381 tons.

Until 1953, when a new company was formed with an initial capital of £E 1,000,000 (nearly $3,000,000), the only other concern of any consequence engaged in rayon weaving was the Textile-Mills of Cairo.

Silk fabric is now being produced at the rate of only about fifty tons a year and imports amount to approximately twice that amount. Sericulture and silk weaving, industries of ancient lineage in Egypt, have experienced many ups and downs through the centuries. They were revived early in the nineteenth century during the Governor-Generalship of Mohammed Ali. Although the growing of silk worms was only indifferently successful, silk weaving, supplied mainly by yarn from Syria, flourished for some time and fancy silk from Egypt, frequently elaborately embroidered with gold and silver thread, found a good market in Europe. The principal silk mill, established at Damietta in 1839, was bought in 1927 by the Misr Silk Weaving Company, a company of the Bank Misr group formed for the purpose. The mill was remodeled and equipped with modern machinery for both silk and rayon weaving, though it now produces mainly rayon fabrics and does very little weaving of silk. (This company has, also, a well-equipped plant for fabric dyeing and printing at Helwan.)

As the rayon industry has grown, silk weaving has been relegated mostly to small hand-loom workshops. These are still to be found rather widely distributed; the greatest concentrations of them are El Mahalla el Kubra, Damietta, Cairo, Idfu, Asyut, and Akmim.

Woolen Goods.

Before World War II Egypt's woolen-goods industry was confined mainly to the weaving of carpets and rugs. Such cloth as was woven was of poor quality as compared with imported cloth; inferior domestic wool was used almost exclusively and weaving methods were generally crude, hand looms being employed for the most part. Also the market was open for foreign goods, and the popularity of these, and particularly of British cloth, effectively deterred the development of the local industry.

With the suspension of imports during the war, the sections of the population that previously demanded foreign goods found themselves obliged to accept the local product. This brought an increased production of domestic cloth and stimulated improvements in its quality. Restrictions on imports from countries in the sterling area, imposed by the government after the war, relieved the domestic industry to a great ex-

tent from the strong British competition, and since 1952 heavy duties on all imports of woolen cloth have further favored it.

Production of woolen cloth was up to 3,500,000 square meters for the year 1951 and to 7,100,000 for 1954 as compared with an average of only 150,000 in the immediate prewar years. Meanwhile, the weaving techniques have been so improved and imports of foreign yarn and raw wool so greatly increased that the quality of a large proportion of the product now closely approaches that of foreign-made fabrics of the same type.

Of the average of some 3500 tons of wool yarn now used annually for weaving, about 500 tons are imported as compared with only 358 in 1938, and of the locally spun yarn, about half is spun from imported raw wool. In 1952, 1408 tons of raw wool were imported as compared with only 114 in 1938. Between 1950 and 1954 the stepped-up production of woolen cloth and the increased use of imported wool helped raise the contribution of domestic cloth to the country's total consumption from one-third to almost 80 per cent.

The mechanized wool-spinning industry is centered in a few mills in Cairo, Alexandria, El Mahalla el Kubra, and Asyut. Woolen cloth is still woven in hand-loom shops in a number of towns, but the industry is now carried on mainly in a few mechanized mills, of which the most important are two in Alexandria and one each at Shubra el Kheima (a short distance north of Cairo) and at El Mahalla el Kubra. The last is a department recently added to the Misr textile plant.

Carpets and Rugs.

Weaving of carpets and rugs is an old handicraft industry in Egypt. The principal product is a coarse carpet, called "kileem," woven of wool and animal hair, sometimes in natural color, but more often in bright bold, symmetrical designs. This is the carpeting commonly used throughout the country. Most of it is woven on hand-looms, and the cost of the material and labor is so low that it is priced within the reach of a large proportion of the population. The annual output of around 450,000 square meters satisfies the local demand and leaves a small surplus for export. The principal weaving centers are Fuwa, Cairo, Minya, Ben 'Adi (Asyut province), Nag 'Hammadi, and in the Kharga Oasis.

During the past twenty years, the government has been striving to improve the quality of the product by instructing the farmers how to do better in caring for their sheep and handling the wool. Today, one of the numerous plans of the Permanent Council for the Development of National Production is to replace hand-loom weaving with a factory industry.

Rug weaving is on a much smaller scale than carpet weaving, and although carried on in small workshops, is done mostly on mechanically operated looms. A good part of it is confined to government trade schools and charitable institutions. For some time the government has also provided training in the weaving of so-called "oriental" rugs in model workshops, with a view to expanding the manufacture of them for both the local market and export.

The principal rug-weaving centers are Cairo, Minya, Asyut, and Nag' Hammadi. Domestic wool is used for the most part, but for the better grades of rugs the yarn is imported. The annual output of about 50,000 square meters satisfies only between thirty and forty per cent of the local demand and is supplemented by imports from Europe and the East.

Fez Manufacture.

The manufacture of felt fezzes or "tarbooshes," the national male headdress, is an industry of rather recent origin in Egypt; it was introduced with the opening of a factory in Cairo in 1933. Before that time the entire supply was imported, mainly from Austria. The industry is entirely dependent on imported merino wool. The finished product has been protected by a high tariff since World War II and as a result has developed rapidly. It now not only completely supplies the local market but produces a surplus that is exported to the Middle East and North Africa. In 1950 the output reached 450,000 unblocked fezzes, or about ten times the average for the years immediately preceding World War II. It has now fallen off to around 300,000 a year, owing to a trend away from fez wearing, particularly among the younger men. The police force and a number of departments of the army have also abandoned the fez.

Blankets.

There is some weaving of blankets in textile mills in Alexandria and El Mahalla el Kubra. The product, woven mostly from domestic wool or cotton, or both, is generally rather crude, but some blankets of better grade are now being woven from imported wool. The present output is about three times the annual average of the period just before World War II, but the demand is small, and production correspondingly so. In 1953 total production amounted to only 1277 tons (31 per cent pure wool blankets, 62 per cent wool and cotton mixed, and 7 per cent cotton), but it was sufficient to supply the local market and leave about 50 tons, mainly of pure wool blankets, for export.

Linen.

Linen weaving in Egypt dates from ancient times and was the most important textile industry there until cotton weaving supplanted it in the early nineteenth century. The annual output of all linen products now averages only a little more than 1500 tons of fabric, including a rather large proportion of the linen and cotton crash in much demand for summer clothing, and about 500 tons of cordage, twine, and thread. Most of the raw material is locally-grown flax and the product from it is coarse and of uneven weave. For fabrics of good quality, imported yarn is used. There is still some hand-loom weaving of linen cloth and some making of cordage by hand, but most of the country's linen products now come from four mills - two in Alexandria, one in Bahteem north of Cairo, and one in the Misr group of mills at El Mahalla el Kubra.

Knitted Goods.

Production of knitted goods as a mechanized industry in Egypt dates only from World War II and owes its origin to wartime shortages of imported goods. The industry has been very much helped by tariff protection. Present production has now reached about 4000 tons a year (three-

fourths of rayon and cotton mixed and the remainder of wool) as compared with an average of only 100 to 200 tons in the 1930's, and is sufficient to supply most of the local demand for low-priced goods. For goods of fine quality the market is still largely dependent on imports. Since woolen goods are knitted chiefly from domestic wool, they are generally of very poor quality, but some items are now being improved in both quality and variety by the use of imported yarns. The principal knitting mills are in Cairo, Alexandria, El Mahalla el Kubra, and Asyut. The most recent development in the industry is the addition to the El Mahalla el Kubra textile group of a nylon hosiery department equipped with American machinery and using American yarn.

Jute.

A start was made in 1943 in the manufacture of burlap from jute fiber imported from India. Burlap is much used in Egypt, especially for cotton sacking and baling, and it was felt that it could be manufactured locally at a substantial saving. Difficulties in getting regular shipments of jute fiber, which is now imported from Pakistan, have very much retarded the development of the industry. At present, it supplies only about a tenth of the country's annual burlap requirements.

Clothing.

The simple and more or less traditional apparel both of the rural population and of a large proportion of the urban population of Egypt is predominantly homemade. The manufacture of ready-to-wear clothing is an industry of small proportions, and the product is of poor quality. Not only is the market for any sort of store-bought clothing extremely limited, but for the relatively small number who wear Western-style clothes, custom-made clothes are cheaper as a rule, than ready-to-wear clothes of the same quality would be. Consequently, there are few garment factories operating on any large scale. The greater part of what clothing is made outside the wearers' own families is made in small workshops.

Of the total of 433 clothing manufacturing establishments of all sizes listed in the official statistics for 1951, nearly 70 per cent employed less than five persons and only eight of them a hundred or more each. Of the total of 4249 persons to whom they gave employment that year, a tenth were under fifteen years of age and nearly a third women and girls.

Food-Processing Industries

Food processing ranks second among Egypt's manufactures in number of persons employed, salaries and wages paid, and value of output, if all its manifold forms are taken into account, as they are in the official statistics. In 1951, the 5654 establishments listed in these statistics employed 72,259 persons, or 27 per cent of the total number engaged in manufacturing. A great many of them (70 per cent) represented a capital investment of less than £E 1000 each, but the percentage of very small ones was rather less than in most other manufacturing groups; only about 13 per cent of them represented an investment of less than £E 100 each and 14 per cent of them £E 2000 or more each.

Milling.

Since grain raising occupies a predominant place in the country's agriculture and grain is the major item in the diet of the majority of the people, milling and baking are the most important branches of the food-processing industry. Mills and bakeries make up 80 per cent of the total number of food-processing establishments (mills 43 per cent and bakeries 37) and employ well over half the total personnel.

An average of somewhat more than 3,000,000 tons of grain (wheat, corn, and sorghum) is ground annually. Stone grinding is still done in many small mills in the villages and towns and grinding stones that differ little, if at all, from those used thousands of years ago are common in the houses of the small farmers. By far the greater part of the flour and meal produced, however, is ground in relatively large mills equipped with steel rollers. From the standpoint of buildings and equipment these represent a larger capital investment than do the manufacturing plants of any other industry; in 1951, out of a total of 2475 mills, large and small, 495 reported a capital investment of £E 2000 or more each (as compared with only 207 spinning and weaving mills in that category out of a total of 4183) and 126 reported as investment of £E 10,000 or more each.

Development of milling as a large-scale industry dates mainly from 1932, when the imposition of a high tariff on imports of flour and meal provided the incentive. Wide distribution of mills in the valley provides relatively easy access everywhere from farm to mill. Grain for Cairo and the delta mills is brought down from the valley mostly by sail boats.

The husking and bleaching of rice is a special branch of the milling industry, and the entire crop is handled in local mills in the rice-producing districts of the northern delta, principally in Alexandria, Rosetta, Damietta, El Mansura, Faraskur, Dikirnis, El Manzala, and El Mahalla el Kubra. About 1,200,000 tons of paddy rice are now produced annually and yield around 800,000 tons when milled. The milling industry has been expanding rapidly with the increase in the area reclaimed for rice growing; production is now about double that of the 1930's.

Baking.

With 2094 bakeries listed in the official statistics for 1951, baking ranks close to milling in number of establishments, and its operating personnel that year totaled 22,367 as compared to 18,166 engaged in milling. Small establishments widely distributed in cities and towns are the rule and the consumers of the products are mainly the non-agricultural population. (The thin, flat cakes of corn or sorghum meal, which are the principal bread of the agricultural population, are mostly home baked.) In 1951 more than half of the bakeries employed less than five persons each, only ten employed a hundred or more, and only one employed more than five hundred. Capital investment is correspondingly small; in 1951 more than half of the bakeries represented a capital investment of less than £E 100 ($287.00) each, only 93 an investment of as much as £E 2000, and only 22 upwards of £E 10,000.

The principal bakery product is the flat disc ('aish baladi), baked of unbleached wheat flour, which forms a major item in the diet of town and city dwellers. The baking of European-style bread and pastries out of flour ground from imported wheat, and to some extent ground out of imported flour, is a side line of substantial proportions in towns and cities, where there is a considerable European population: 467, 395 tons of wheat and mixed wheat and rye were imported in 1953 and 85, 824 tons of wheat flour and mixed-wheat-and-rye flour.

Sugar Crushing and Refining.

In value of output the production of sugar and other sugar-cane products is Egypt's second-most important food-processing industry. In 1951 its 131 mills and one refinery employed a total of 17, 335 persons and the product was valued at £E 19, 233, 979, or nearly a fourth of that of the whole food-processing industry. Most of the mills and the refinery represent rather large capital investments as compared with those in other manufacturing industries - 110 of them represent investment of between £E 200 and £E 2000 each in 1951 and 6 of them investments of £E 10, 000 or more.

The present sugar industry had its start under the Khedive Ismail, but suffered many vicissitudes before it achieved its present stability of organization and efficiency of operation. Ismail dug the Ibrahimiya Canal to water his sugar plantations in the lower valley and the Faiyum; he also built seventeen sugar mills in the valley provinces of Beni Suef, Minya, Asyut, and Qena, and in the Faiyum, and laid rail networks to serve them. Most of the raw sugar was sent to France for refining until 1881, when a group of local financiers opened a small refinery at El Hawamdiya, about ten miles south of Giza.

Ismail was as notoriously extravagant in building up his sugar industry as he was in the other enterprises to which he put his hand. This was one factor which forced his industry into liquidation before the end of his reign. Another was overproduction at a period when steadily increasing competition from the West Indies and the development of the government subsidized beet-sugar industry in Europe was robbing Egyptian sugar of its European market.

After a considerable lapse of time, during which the little that remained of the industry was split up among a number of small companies, two companies organized with French capital took over - the Company of Sugar Mills of Upper Egypt and the Company of Sugar Mills and Refinery of Egypt organized, respectively, in 1892 and 1893. In 1897 the two were amalgamated in the General Company of Sugar Mills and Refinery of Egypt, and in a few years this company had effected the consolidation of the entire industry. Many of Ismail's mills were shut down and a number of the smaller ones were forced to liquidate; the only ones retained were those at Armant (Qena province) and Abu Qurgas (Minya province). The laying of the foundations of the present industry was finally completed with the building by the company of mills at Nag' Hammadi (1898) and at Kom Ombo (1910).

Not, however, until after a protective tariff was imposed on sugar imports in 1931, did the industry prosper, except for temporary booms during the Spanish-American War, when sugar imports from the West Indies were cut off from the European market, and during World War I.

In 1931 an agreement was signed between the government and the General Company of Sugar Mills and Refinery by which the company was given the monopoly of the sugar industry. In return, the company guaranteed to supply the local market with sugar and other cane products and also to attempt to do so from locally grown cane and to import only as much raw sugar as might be needed to make up any shortage in the local crop. Besides granting the monopoly, the government guaranteed to the company at least a sufficient revenue to pay a net profit of 5 per cent on the capital investment after all costs of production and depreciation charges were covered. Out of profits remaining after costs and the guaranteed net profit were deducted, the government was to collect a tax of 70 per cent on the first £E 15,000, 80 per cent on the second, 85 on the third, 90 on the next £E 35,000, and 95 on anything additional.

This agreement was for a five-year period, but the company was given the option of renewal for three consecutive periods of three years each. The agreement was continued for the entire fourteen years, but by the end of this term in 1945 the industry was operating so successfully, and so satisfactorily to the government, that the monopoly was retained. All of its original features are still in force today. The government collects a good revenue in taxes and in recent years the retail price of sugar and other cane products has been rather lower in Egypt than in many other sugar-producing countries. Naturally, however, there were times while the company was getting on its feet, when the shortage of cane and the high protective tariff, which is still in force, made local prices much higher than the world-market price.

In addition to a large number of small mills located for convenience in the various small cane-growing districts, the company now operates five large ones - at Kom Ombo (Aswan province), Armant and Nag' Hammadi (Qena province), and Abu Qurgas and Sheikh Fadl (Minya province). The first three of these contribute 75 per cent of the raw sugar received at the company's only refinery, at El Hawamdiya.

Work at the mills is seasonal; cutting of the cane begins in December, and the crushing usually continues well into April. The El Hawamdiya refinery operates the year around. The company makes a practice of assisting the small growers in financing their crop.

Of the sugar produced, 65 per cent is now consumed in Egyptian households and domestic consumption is steadily increasing. In 1950 it averaged 12.9 kilograms (28.5 pounds) per capita as compared to 7.5 in 1933. (Consumption is around 95 pounds per capita in the United States.) Consumption is reported as still rising. To the farmer, who uses it mainly for sweetening the tea and coffee in which he indulges heavily, sugar is as indispensable as to the urban dweller. For some time production not only met

the local demand but left some for export; even as recently as 1950 exports of sugar amounted to 1768 tons. But local consumption has been rising so sharply that, in 1953, 129,000 tons of raw sugar were imported to supplement domestic production. The aim of the company now is to produce 300,000 tons of refined sugar annually with a view to meeting fully the local demand, at least for some time to come. (This company is now presumably under government management.)

The refinery product is mostly crude sugar in coarse granules, some of which is made up into the large cones popular in the villages and in the Middle East markets. About twenty per cent of the production is used in the local confectionery industry. Candies and other confections, all of rather poor quality, are produced in numerous small establishments throughout the country for local sale. A few of these establishments in Cairo and Alexandria manufacture products of better grades, but the best cannot compete in quality with foreign products, which are imported in considerable quantities.

Molasses is a rather important secondary product of the sugar mill. Its average annual production now runs around 90,000 tons, of which 25 to 30 per cent is exported. Most of the remainder is bought by the farm families, for whom it is the common sweet. Some is also used in the manufacture of alcohol and carbon dioxide is extracted from it for use in soft drinks and refrigeration.

The Tobacco Industry

The manufacture of tobacco products (cigarettes, cigars, and pipe tobacco) is a major industry in Egypt in terms of capital investment, labor employed, and value of output. Of fifty-one factories listed in official statistics for 1951, eighteen represented a capital investment of £E 10,000 or more each and only twelve an investment of less than £E 1000 each. Owing to the high cost of the raw material, however, the total output in 1951 was valued at only about 12.5 per cent more than the cost of the material processed (see Table 3). On the other hand, it will be seen from Table 4,[16] that, for many years, the customs duty on imported tobacco leaf has made a large contribution to government revenue; for the five-year period 1950 to 1954 it contributed a yearly average of 35 per cent of the total customs receipts and 16 per cent of the total revenue of the government.

Table 4 - Annual Contribution of Tobacco Tariff to Government Revenue

Period	Tobacco tariff in £E millions	Total customs receipts in £E millions	Total revenue in £E millions	Tobacco tariff in percentages of Custom receipts	Tobacco tariff in percentages of Total revenue
1890-1899	0.9	1.7	11.2	52	8
1900-1909	1.4	3.1	14.9	46	10
1910-1919	1.9	4.8	20.6	41	10
1920-1929	5.8	11.7	40.0	50	15
1930-1939	5.9	15.7	36.4	38	16
1940-1949	17.4	37.7	99.4	50	18
1950-1954	31.9	92.2	201.3	35	16

All tobacco leaf is imported, and the heavy import tax on it makes up a very large proportion of its cost to the manufacturer. For example, the actual price of the 12,660,000 kilograms of tobacco leaf imported in 1951 was £E 5,133,630, or an average of £E 0.405 per kilogram, but the import tax that year was £E 2.50 per kilogram, or £E 31,650,000 for the total amount imported. The total cost to the manufacturers for their raw material that year thus would have been £E 36,783,630 if they had used only that year's import and had used all of it. As will be seen from Table 5, the tobacco processers paid only £E 31,152,000 for their supply of leaf. Obviously, therefore, only a part of the 1951 import was used, and it may have been supplemented by withdrawals from the previous year's import, when the customs tax was lower - £E 2.10 per kilogram. Tobacco imports are stored in customs warehouses under bond to be drawn on as needed, and an accumulated stock sufficient for two or three years is not uncommon.

Tobacco manufacturing was introduced into Egypt in the late 1870's by Turkish manufacturers operating under a monopoly set up by the Turkish Turkish government. For a good many years it was a handicraft industry producing mainly handmade cigarettes and fine-cut tobacco for "roll-your-own" cigarettes. The making of handmade cigarettes for sale was brought practically to an end with the introduction of machinery early in the present century, but there is still a considerable practice among the country people of rolling their own.

A part of the tobacco used in the early years of the industry was locally grown, but since 1890 the government has strictly prohibited all tobacco growing in Egypt as a measure for providing an added source of revenue from duties on imported supplies. In spite of increases through the years in government revenues from other sources, the duty on leaf tobacco has been repeatedly raised - from £E 0.20 in 1910 to £E 3.00 in 1952. Ad valorem taxes on the manufactured products (at present 8 per cent) and other state and municipal fees still further decrease the

Table 5 - Tobacco Imports (in metric tons)

Year	Raw tobacco		Tobacco products		
	Leaves	Tobac	Cigarettes	Cigars	Smoking tobacco
1910	7,553	659	----	73	61
1920	8,275	472	----	44	301
1930	6,823	446	135	29	14
1940	5,129	200	448	11	47
1944	9,717	469	1,993	19	31
1949	13,091	384	571	7	20
1950	12,489	368	513	9	15
1951	12,338	322	461	15	15
1952	11,676	300	184	7	7
1953	10,740	256	151	6	6

manufacturer's profits or increase the price of the finished product to the consumer, or both.

Increases in import duties and other taxes were more or less consistently followed by decreased domestic per capita consumption, except during the prosperous years of World War II, when it rose to an all-time high. Now it is declining again and the industry is inclined to argue that taxes can go no higher without serious repercussions in the home market.[17]

In 1954 the Council of Ministers gave their approval in principle of a return to local tobacco growing under conditions to be laid down by the Permanent Council for the Development of National Production in Collaboration with the Ministries of Agriculture and Finance. The local agricultural experts, however, are rather generally of the opinion that neither climatic conditions nor the heavy valley and delta soils are suitable for growing tobacco of high quality.

Cigarettes.

Cigarette making is the chief activity of the tobacco industry. Production, which now runs to around 10,000 million annually, is concentrated in fourteen large factories financed mainly by Greeks and Armenians and equipped with modern machinery. All these represent capital investments of £E 2000 or more each, and ten of them of £E 10,000 or more. A profusion of brands is made and there was long a good market abroad for many of them, with certain factories in Alexandria manufacturing expressly for export. Until recently Turkey and Greece supplied by far the greater part of the leaf, but a number of other countries are now competing strongly with them, as shown in Table 6.[18] The export of the once widely marketed oriental-type cigarettes of Turkish and Greek tobacco has now

Table 6 - Egyptian Imports of Tobacco Leaf (in 1000 kg.)

Country of origin	Average 1946-1950	1952	1953	1954
Turkey	4973	3741	3008	2644
United States	1789	2049	2439	2917
Greece	927	1769	1503	1706
India	989	1062	1060	1034
China	283	480	441	510
U. S. S. R.	133	527	430	491
South African countries	2563	2323	1989	1682
Other countries	1464	942	684	775
Total	13,121	12,893	11,554	11,759

greatly declined owing to the fact that they are being manufactured in many countries that were formerly good customers and to tariff restrictions those countries have imposed to protect their manufacture. At present only about 100 tons are exported annually as compared with a prewar average of about 300 tons.

Until recently, also, large amounts of tobacco were imported from the Far East, particularly from China and Japan - an average of nearly 2,000,000 kilograms a year during World War II, when there was a severe shortage of stocks from other countries. Although this tobacco is cheaper than that from other countries. Although this tobacco is cheaper than that from other sources, it is of poorer quality, and also, because of its light weight, yields less import revenue. Consequently, its importation has been very much restricted since the war.

The importation of tobacco from the United States for cigarette making on any large scale dates from the 1930's, when a British-American combine was formed for the manufacture of various British brands of Virginia cigarettes that had come to be imported in substantial quantities. Not, however, until World War II, when the country was flooded with British and American cigarettes, was there any significant shift of the public taste to them from the oriental types. In 1942 a total of 2580 tons of British and American cigarettes was imported as compared with prewar imports of no more than 100 to 200 tons a year at most.

With the increasing preference for American-type cigarettes the local industry was soon manufacturing less and less of the oriental blends and using more and more of the American varieties of tobacco. From 1951 on, these importations have been running to around 5000 tons, of which 60 per cent has come from the United States and the remainder from Rhodesia and other southern countries of Africa where the growing of American types of tobacco has been making rapid progress.

The importation of cigarettes has declined correspondingly. In 1953 only 151 tons were imported. A further decline has followed a heavy increase in the duty on all imports of tobacco products which was decreed by the government in February, 1954. Now the only imported cigarettes are from the United States and the United Kingdom, and they are so high priced as to be very much of a luxury.

Other Tobacco Products.

Two principal types of pipe tobacco are produced, known as tombac and me'assel. Tombac is a special variety of leaf imported from Iran and favored for its distinctive aroma. The leaves, of which about 300 tons are processed annually (3 to 4 per cent of the total leaf used by the tobacco industry), are cut into ribbons for smoking in the glass water pipes called narghila or shisha. Me'assel is a mixture of tobacco and molasses in which the molasses content is fixed by law at no more than 25 per cent. It is smoked in the goza, a crude, low-priced water pipe much used by the poorer classes. The bowl of the goza is fashioned from a scooped-out coconut shell and a bamboo stem. Me'assel is manufactured in a number of

small factories which cater mainly to nearby markets, but around 40 tons are exported annually to neighboring countries.

Cigars for the local market are made in Alexandria but the demand for them is limited and the output, consequently, small. A few tons, of cigars are imported annually for the luxury trade - 3.5 tons in 1953.

Beverages and Alcohol

Soft drinks, carbonated water, and beer are the principal beverages manufactured in Egypt. There is a considerable business of alcohol distilling and the product is improperly grouped with beverages in the official statistics. Little, if any, of the locally produced alcohol is used in making liquors, since Moslem law forbids Moslems to drink, manufacture, or handle alcoholic liquors. What beer and wine is manufactured is for non-Moslem consumption.

Soft drinks.

The manufacture of soft drinks and carbonated water has developed into a fairly important industry in recent years. The total output in 1951 was valued at £E 6,522,753. Of 153 manufacturing and bottling establishments reported in the official statistics for 1951, 42 represented a capital investment of £E 2000 or more each and 18 an investment of £E 10,000 or more. Most of the plants are equipped with modern machinery, and the industry, consequently, affords relatively little employment as compared with many others. A total of only 6711 persons were employed in 1951; two-thirds of the plants employed less than fifteen persons each, and only fourteen of them fifty or more. There were, however, three large plants with 500 or more employees each.

The industry uses about 15,000 tons of sugar a year. For fruit juices for flavoring and other basic ingredients it depends mainly on imports. Consumption of the product is pretty much limited to urban dwellers, and the industry is, consequently, mainly concentrated in Cairo, Port Sa'id, Ismailiya, and Suez, but there are small plants in most of the provincial capitals. The manufacture of Coca Cola and Pepsi Cola was introduced a few years ago in plants near Giza, and the popularity of these drinks soon spread even to the remote villages.

Beer.

Most of the beer brewing is done in Alexandria and Giza and is in the hands of Greek residents. The industry as a whole is a rather large one for a country in which so great a proportion of the population are total abstainers. Beer and other malt products to a value of £E 602,112 were manufactured in 1951. Most of the breweries are small The 42 operating in 1951 employed a total of only 766 persons, 26 of them represented a capital investment of less than £E 50 each and all but three an investment of less than £E 500. Both domestic and imported barley is used.

Alcohol.

Alcohol is distilled entirely from molasses supplied by the country's sugar mills, and the industry has been steadily expanding in recent years in step with the development of the sugar industry. In 1952, 144,000 hectoliters

(about 3,800,000 gallons) were produced as compared to only 46,000 (about 1,195,000 gallons) in 1939. The greater part of the production comes from the Cozzika (Kotsika) distillery located about ten miles south of Cairo. Locally the alcohol is used mainly in the chemical industries and in the manuf acture of vinegar. A substantial surplus is left for export; 30,311 hectoliters (about 800,000 gallons) were exported in 1952.

Liquors and Wine.

All the distilled liquors consumed are imported and most of the wine. Distilled liquors were coming in at the rate of about 10,000 hectoliters (between 26,000 and 27,000 gallons) a year when, in 1952, they were included among the luxuries on which new, high import duties were decreed. Since then there has been a notable decline in imports. Imports of wine have also declined. In 1952 they amounted to only 7000 hectoliters, whereas in the 1930's they had run to almost 50,000 a year. This decline is largely to be attributed to the increase in custom duties; but part of it is to be credited to the development of domestic wine making which Greek and Armenian vintners have recently introduced at Alexandria, using grapes grown nearby expressly for the purpose (see Chapter 4, Agriculture).

Leather and Leather Goods

With annual slaughterings of livestock exceeding 3,000,000 head, Egypt has a supply of hides and skins more than sufficient to meet the present demands of the local market for leather and leather goods.

Tanning.

The tanning and finishing of leather as an industry of any importance dates only from 1930 when the government imposed a protective tariff on imported goods. Before that date the greater part of the hides and skins that came on the market were exported raw or only partly tanned, and the local market for leather and leather goods was almost completely dependent on imports, of which the United Kingdom supplied the greater part. Since 1940 the export of raw hides has been heavily restricted by law.

As the result of the tariff and discouragement of exports the local tanning of leather has developed to a point where it supplies all the home needs and leaves a surplus for export. In 1953 tanned leather and various leather products exported totaled 270 tons as compared with only about 150 tons imported. Exports of hides that year amounted to only 240 tons (as compared to upwards of 4000 tons a year in the 1920's) and consisted entirely of undressed sheep and goat skins. Imports of undressed hides amounted to only about 17 tons in 1953, mainly cowhide and horsehide.

Tanning and finishing methods and skills have been so improved from the crude beginnings of less than thirty years ago that the products are of sufficiently good quality to meet most of the needs of the local leather-goods industry. About 6600 tons of tanned leather are now turned out annually, of which 80 per cent is sole leather, 14 per cent chrome-tanned upper leather, and the remainder vegetable-tanned upper leather. Skinning is apt to be

rather crudely done, with the result that a good many damaged hides arrive at the tanneries, but in line with present plans to increase and improve production, efforts are being made to induce slaughter houses and farmers who butcher their own livestock to exercise greater care in handling the hides.

Most of the tanneries are small; of 128 reported in the official statistics for 1951, nearly a third employed less than fifteen persons each and only eleven of them more than fifty. There has been, however, some movement recently toward consolidation of the industry, and one tannery now has somewhat over 500 employees.

Leather Goods.

The manufacture of footwear is by far the most important branch of the leather-goods industry. It uses rather more than 75 per cent of the leather turned out by the local tanneries. In the official statistics for 1951, 1733 establishments were listed, employing 6486 persons; 1530 of these establishments were engaged in shoe and boot making and provided practically year-around employment for 5517 persons. The annual output now runs to between 4,000,000 and 5,000,000 pairs of footwear of all types; it meets the local demand (except for certain special types of footwear) and includes a surplus for export. In 1952, 202,711 pairs were exported to Middle East and nearby Mediterranean countries as compared to only 11,380 in 1937. Some footwear is still imported (88,914 pairs of various kinds in 1952), but the value of the exports usually exceeds that of the imports by more than 75 per cent.

Handicraft artisans still play an important part in the manufacture of footwear, as they do in all branches of the leather-goods industry. Of the establishments manufacturing footwear in 1951, 73 per cent represented a capital investment of less than £E 100 each and 81 per cent employed less than five persons. On the other hand there has been a growing movement toward consolidating the industry in larger plants; in 1951, 50 plants represented an investment of £E 1000 or more each and 18 of these an investment of £E 10,000 or more. One of the largest is a factory of the Bata Company of Czechoslovakia in Cairo. This factory has been very much enlarged since it began operations in 1950 and has done much in leading the way to improvement of the factory product in general and in promoting the sale of factory-made footwear. The other large factories are mainly in Cairo, Alexandria, and Damietta.

Rubber Footwear.

The manufacture of rubber footwear was introduced into Egypt by the Bata Company shortly before World War II. Rubber-soled shoes with cloth tops are very much in demand because their price is low as compared with that of leather footwear. The supply of these and other types of rubber footwear came largely from Japan before the Bata Company began their manufacture. Now two factories, one in Cairo and one in Giza, supply all the requirements of the local market. Their output in 1951 was valued at £E 489,760, nearly one-third as much as the value of all the leather footwear produced that year.

Woodworking

For its woodworking industry Egypt is obliged to depend almost exclusively on imported timber and lumber. Imports amount to between 200,000 and 300,000 tons annually; 232,993 tons valued at £E 7,693,387 were imported in 1953. Some local timber is used, mainly from the date palm, but the amount is insignificant and most of the product takes the form of simple implements used by the farmers. A considerable amount of rough timber is imported for railroad ties, pit props, piling, and the like (about 12,000 tons in 1953) and some saw logs, but the greater amount is dressed lumber (90 per cent of the total weight in 1953). There is also a growing demand for veneers, fiberboard, plywood, and presswood sheets, of which 17,177 tons, valued at £E 934,733, were imported in 1953.

Furniture making, house building, and sailboat and barge construction are the principal activities of the wood-working industry. Furniture shops and factories, by far the most important branch of the industry, account for about 70 per cent of all the establishments and 65 per cent of the employees. Most of the plants are small, a very large proportion of them being handicraft shops. Of 1175 reported in the official statistics for 1951, 916 employed less than five persons each and the ten largest only between fifty and 250 each. But the larger plants are fairly well equipped with labor-saving machinery; 53 of those operating in 1951 represented a capital investment of over £E 2000 each and 27 of them £E 10,000 or more. These larger factories are mainly in Cairo and Alexandria, but factories in Damietta in the delta and Asyut in the valley also manufacture on a fairly large scale.

European furniture design is closely copied, and the domestic furniture industry has met practically all the requirements of the local market for many years. The output of the small shops is generally rather poor in finish because these shops cannot afford to buy high-quality lumber or carry sufficient stock to hold it for seasoning. Although most of the furniture is sold in the cities and towns, the introduction of veneers and plywood has made it possible to produce cheaper furniture than formerly and thus has somewhat widened the market. The ancient art of inlaid cabinet work is still a shop industry of some importance, with the main centers in the old bazaars of Cairo (Muski and Khan el Khalili) and in Asyut.

The sailboats and barges that carry bulky agricultural produce on the Nile and the main canals, the large sailboats of the fishermen on the coastal lakes, and the sailboats and other vessels used in coastwise trade are mainly of local construction. There are centers for the building of Nile boats and barges at the northern (Rod el Farag) and southern (Atar el Nabi) wharves in Cairo and also at Giza. Damietta and Rosetta are the centers for the building of fishing and coastwise craft.

Chemical and Pharmaceutical Industries

Egypt's chemical and pharmaceutical industries are, for the most part, of recent growth (many of the branches date only from World War II). Except for soap making, the operations are on a rather small scale and a large proportion of the raw material has to be imported. The high cost of fuel and

power, the shortage of qualified technicians, and the want of raw material have served to retard the large-scale development of the industry, in which about 8000 persons are now employed. The total output in 1951 was valued at only £E 7,760,897, whereas imports of manufactured products of this type that year cost £E 26,100,000, of which 46.5 per cent was for fertilizers, 36.6 for other chemicals and pharmaceutics, 10.5 for dyeing and coloring substances, and 6.4 for soaps and related products, essential oils, and cosmetics.

Soap Making.

Of all the chemical industries soap making is the best developed. Protected by customs duties on competitive products since 1930 and with the vegetable oils and caustic soda, which are its principal raw material requisites, largely produced locally, its products are now sufficient in quantity and variety to satisfy most of the needs of the local market and leave a small surplus for export (246 tons were exported in 1951, as compared with only 26 tons in 1934, mostly to Middle Eastern countries). More than half the vegetable oil is cottonseed oil, of which a plentiful supply is produced in the country. Other vegetable oils are partly produced locally and partly imported. Soap imports in recent years have averaged less than 2000 tons a year and have consisted mainly of high - quality toilet soaps, shaving soap, medical soap, and creams. Production, which now runs to somewhat more than 60,000 tons a year, is still predominantly of household and laundry soap, but a number of the products compare well with high-grade importations, and some internationally known brands of toilet soap, such as Sunlight, Lux and Palmolive, are now manufactured at the Cairo plant of the Anglo-Egyptian Combine for Soap and Edible Products.

Although there are many small soap-making concerns scattered over the country and catering mainly to the market in their immediate vicinities, the industry is dominated by a few fairly large, modern factories in Cairo, Alexandria, and Kafi el Zaiyat. The principal producer is the Egyptian Salt and Soda Company with factories at Cairo and Kafi el Zaiyat.

Sulphuric Acid.

The present annual production of somewhat more than 20,000 tons of sulphuric acid is nearly sufficient for present local needs. The greater part of it is used in the manufacture of superphosphate fertilizer from natural phosphate, of which the country has an abundant supply. Most of the sulphur is imported - 5132 tons in 1951. The principal plant is at Kafi el Zaiyat, but a plant recently set up in Cairo now manufactures between 30 and 35 per cent of the annual output.

Other Chemicals.

Other chemicals produced in small quantities are sodium silicate (estimated annual production about 2000 tons), hydrochloric acid (1000 tons), lead monoxide (720 tons), and copper sulphate (110 tons),[19] but none of them produce enough to meet local requirements. In 1952, 26,784 tons of inorganic and organic acids and salts (caustic soda excluded), valued at E 170,665, were imported.

Fertilizers.

Although Egypt is a very heavy user of chemical fertilizers, manufacture of them is a recent development and, except for that of superphosphate, is still only on a small scale. Annual consumption in normal years is around 850,000 tons and until 1953 imports had for some time been averaging a little more than 600,000 tons, of which nearly ninety per cent was natural sodium nitrate, synthetic sodium, calcium, and ammonium nitrates, and other nitrogenous fertilizers, and ten per cent phosphates. In 1953 imports fell to only 362,014 tons, partly owing to the increased local production of calcium nitrate, but partly, also, to shortage of funds and consequent restriction of imports.

Production of both superphosphate and calcium nitrate has been steadily increasing. In 1951, 76,469 tons of superphosphate or seventy per cent of the quantity used, were produced locally, as compared with only 21,175 tons in 1938. By 1954 the output had been so increased as the result of import restrictions that the country was practically self-sufficient. The manufacture of calcium nitrate was begun in 1951 by the Egyptian Company for Fertilizers and Chemical Products at Suez, where both limestone and fuel oil are near at hand, and production is now up to about 130,000 tons a year - two-thirds the present local requirement.

The government is reported to be considering bids for the erection of a plant for the production of nitrogenous fertilizer at El Khattara, a little less than ten miles north of Aswan. Hydroelectric power from the generators installed in the Aswan Dam will be used and the planned capacity production of 370,000 tons a year will make Egypt practically self-sufficient with respect to calcium nitrate as well as to superphosphate.

Matches.

The annual output of sulphur matches, which now runs to nearly two billion, meets 85 to 90 per cent of the local demand. In 1951, the country's six rather large match factories (each represented a capital investment of £E 10,000 or more) employed a total of 1193 persons. All of the sulphur used is imported.

Pharmaceuticals.

The pharmaceutical industry in Egypt received its first real impetus during World War II, when there was a serious shortage of medical supplies from abroad. Three companies, the Chemical Industries Development Company, the Misr Company for Pharmaceutic Products, and the Imperial Chemical Industries Company, are the principal producers. The output is still small and mainly limited to products that require little in the way of special techniques and specialized technicians in their preparation. Although there is some export of local manufactures to nearby countries (about forty tons valued at £E 27,000 in 1953), the local market depends on imports for most of its supply; 3758 tons valued at £E 4,800,000 were imported in 1951.

The manufacture of aspirin has come to be one of the best-developed branches of the industry, and the manufacture of penicillin has been recently introduced, with plans for its production geared to supplying both the local market and a large potential market in the Middle East and the Sudan Republic.

The ingredients for the manufacture of pharmaceutical products are largely imported, but such materials as alcohol, ammonia, glucose, glycerine, vegetable oils, and various medicinal plants are locally available, as well as sulphuric, hydrochloric, and nitric acids.

The Paper Industry

Paper.

Paper manufacturing in Egypt is carried on mainly in a few fairly large mills; of thirteen listed in the official statistics in 1951, only five employed less than fifty persons each, and one, the mill of the National Paper Company at Abu Qir, east of Alexandria, which has been in operation since 1939, employed between 500 and 600. Most of the paper is made of rice straw, and the principal products are wrapping paper and cardboard. There has been substantial development of the industry from year to year since World War II, and it now supplies nearly the whole of the local demand for the types of paper manufactured. In 1954 the total production was 24,200 tons as compared with 19,900 in 1950.

For newsprint and specially processed papers of various kinds the country until recently has depended entirely on imports, but the National Paper Company is now doing some manufacture of newsprint and some of the better grades of book and writing papers. Imports of all types of paper, except common wrapping paper, increased steadily until 1951, when 80,116 tons were imported as compared with 53,746 in 1946. Since then they have declined considerably, owing to general restrictions on the importation of all but the most strictly essential products and the disturbing effect the revolution of 1952 had on many business enterprises.

Pulp and Paper Products.

There is a considerable industry of manufacturing various articles from locally produced and imported paper pulp and paper. In 1951, 3893 persons were employed in the 133 establishments reported as engaged in this branch of the industry. Most of the establishments are small, but a number of them employ more than 200 persons each, and the total output that year was valued at £E 1,264,562.

Printing and Publishing

Since Cairo for centuries has been the center and fountainhead of Islamic learning, naturally it has also come to be the principal publishing center of the Islamic world. The product of its presses, however, was very much limited as to both volume and quality, and its publishers had much of their printing done abroad.

As an industry operated on more or less modern lines, printing developed only after the duty on imports of printed matter was raised in the tariff reform of 1930. It has had a remarkable growth. Imports of newsprint increased from 6928 tons in 1934 to 18, 531 in 1951. In 1951 there were thirteen establishments, with 1043 employees engaged in printing newspapers and periodicals, and a total of 289 other printing establishments with a total of 8547 employees. Many of the establishments are small, but several employed more than fifty persons each that year and one of them had a staff of between 500 and 600. The total number of persons employed in 1951 in printing and its allied industries (bookbinding, lithography, photoengraving, etc.) was well over 10, 000, and their output was valued at £E 1, 982, 311.

Most of the important printing and publishing concerns are in Cairo and Alexandria. Besides private enterprises, there is a Government Press in Cairo and the printing works of the Survey Department at Giza, which together handle all the government printing.

Metal Industries

Metal industries in Egypt are much underdeveloped, even for a country in which manufacturing in general is of such minor importance as compared with agriculture. In spite of fairly substantial advances in many branches of the industry in recent years, the country still depends largely on imports of raw materials and manufactured articles, and these imports are steadily increasing. Imports of iron and steel in 1951, shown in Table 7, were a third higher than in 1939 and about 27 per cent higher than in 1946, while the tonnage of importations of machinery and appliances that year was seven times that of 1939, and that of vehicles and other transport equipment five and a half times.

Table 7 - Metal Imports, 1951 (Value in £ E 1000's)

Imports	Tons	Value
Ores (mainly nonferrous)	35, 283	219
Iron and steel (sheets, bars, etc.)	224, 670	8, 553
Nonferrous metals (sheets, bars, etc.)	6, 954	1, 912
Manufactures (except machinery)	43, 696	6, 728
Machinery (except electrical)	40, 313	13, 233
Electrical machinery and supplies	18, 598	8, 078
Vehicles and other transport equipment	40, 487	15, 039
Total	409, 600	53, 762

Iron and Steel.

Among the metals, iron is the only one of which Egypt has any significant deposits, so far as is known at present. Although the known deposits could supply the country with its iron and steel requirements for many years to come, there has been practically no exploitation of them for that purpose, owing to the lack of fuel and power cheap enough to make the working of their product profitable. (See Chapter 8, Raw Materials and Mining.)

The industry is now confined to the casting of simple structural iron and pipe from scrap and some manufacture of light machinery and appliances, household utensils, tools, and transport equipment. Only about 23,000 persons are employed in all branches of the industry. Most of the works are small; of 1441 reported in the official statistics for 1951, less than twenty per cent represented a capital investment of more than £E 1000 each and only 75 an investment of more than £E 10,000. Only four per cent employed more than fifty persons each. The value of the total output in 1951 was £E 16,200,000 as compared to £E 53,762,000 paid for the year's purchases in kind from abroad.

Foundries.

Scrap serves as the material for what there is of a basic iron industry. The present supply is what is left of some 250,000 tons discarded by the Allied forces during and following World War II together with the country's own yearly accumulation of about 40,000 tons. All of the latter had been exported until it occurred to certain local investors that this, plus the wartime accumulation, could furnish the material for a fairly lucrative enterprise for some years to come. They accordingly set up three foundries to handle it. The government at the same time prohibited all export of scrap. The three foundries are now averaging an annual production of pipe, bars, and other structural iron that meets nearly thirty per cent of the local consumption figure for this type of iron and steel materials. As of 1954, it was figured that the reserve of scrap would be exhausted in three years.

A number of plants are now making steel castings on a small scale for transport equipment, electrical appliances, and spare parts for machinery. The first and largest of these set up by the Cairo Tramway Company after World War II and using an electric furnace for smelting has an annual output of about 300 tons. Several small foundries make aluminum and copper castings, and two copper refineries, which were set up after the war and use imported copper, turn out around 2000 tons of refined copper a year.

Metal Manufactures.

The manufacture of metal products from imported materials is the principal activity of the metal industry. A wide variety of goods for the local market is produced under import duty protection - metal furniture, bedsprings, household utensils, and small tools and hardware. Particularly important is the manufacture of pressed aluminum utensils, copper and enameled kitchenware, and razor blades. The manufacture of electrical supplies has also made good progress in the last ten years. The supply of upwards of 3,000,000 light bulbs now produced annually meets between 65 and 70 per cent of the

local requirements. That the production of fluorescent lamps and neon transformers (about 25,000 and 2000, respectively, a year) falls far short of satisfying the demand is ascribed by the manufacturers to the high duties on the raw materials. On the other hand, a low tariff on the imported materials encourages the manufacture of batteries, of which production now runs around 28,000 a year.

The manufacture of tramcars, railroad coaches, and bus bodies is making good progress. In 1951 ninety bus bodies and forty tramcars were produced. The local assembly of motor vehicles has been encouraged by low duties on parts, and plants have been opened in Alexandria and Cairo. In 1952, the Ford assembly plant in Alexandria turned out 7000 automobiles, trucks, and tractors as compared with only 2278 the year before. In 1955 plans were also nearing completion for the erection by the Egyptian Transport and Engineering Company and an American concern of a tire and tube factory at Alexandria.

Electricity

In Egypt electricity is generated mainly with oil fuel. The powerhouses of the delta and valley, some sixty in all and operated mostly with oil engines, use about a sixth of all the fuel oil consumed in industry. In spite of the great year-round hydroelectric potentialities of the Aswan Dam and the potentialities of the other barrages, at least for part of the year, the only hydroelectrical generation of power of any consequence is at the Nag' Hammadi Barrage. Total production in 1953 which was 701,000,000 kilowatt hours, marked an increased of eight per cent over 1946, but amounted to only 31.9 kilowatt-hours per capita as compared to 540 in Japan, 700 in Great Britain, and 2580 in the United States.

Most of the current is consumed by the larger factories, for light in cities and towns, and for operating irrigation and drainage pumping stations. Very few of the villages have electric lights. The present government has elaborate plans for increasing production and has taken a number of important steps in that direction. In 1954 and 1955, £E 16,100,000 (about $46,000,000) were spent in building new plants and enlarging old ones. In 1954 new powerhouses were completed at Nag' Hammadi and at Talkha (opposite El Mansura in Gharbiya province), the latter to supplement the network in the northern delta, and one under construction between Cairo and Helwan was expected to come into operation in 1957 or 1958. In 1955 the powerhouse in northern Cairo was enlarged to meet the increasing need for current there, as was the one at Idfu. The Nat' Hammadi plant was built and the Idfu plant was enlarged in response to the need for additional power for operating irrigation and drainage pumps in Upper Egypt.

All of this new construction is for thermally generated power. The installation of generators at the Aswan Dam has been a constantly recurring subject of discussion in government circles since the 1920's but financial and political obstacles and the fact that the greatest concentration of prospective consumers is in the delta, 900 miles and more from the dam, prevented any

action on it until 1947, when a number of foreign companies were called in to formulate plans. Only under the present government, however, have any definite steps been taken to put these plans into execution. Construction of two power stations, of which the total cost is estimated at £E 27,500,000, is now under way. One is expected to be completed in 1958 and the other the following year.

Capacity production of the Aswan generators is estimated at 2000 million kilowatts a year. Most of the power will be used by the nitrate plant planned for erection at Khattara, a few miles north of Aswan, for mining operations in the Aswan ore deposits, for operating irrigation pumps in Upper Egypt, and for bringing light, power, and potable water to the valley villages. The transmission of current to the lower valley and delta is also proposed, especially if the so-called High Dam for perennial water storage is built (see Chapter 5, Irrigation). It is estimated that the power capacity of the generators planned for installation at this dam will be five times that of the Aswan generators.

Nonmetallic Mineral Products

Egypt has a varied industry of considerable proportions based on the country's abundant resources of limestone, gypsum, clay, sand, and other quarry products. It provides employment for nearly 20,000 persons, and the value of its annual output, mainly cement, brick, pottery, glass, and pigments, runs to around £E 9,000,000 (about $26,000,000).

Cement.

The cement industry dates only from the beginning of the present century. Production comes mainly from three plants a few miles south of Cairo, where the Tura and Helwan hills provide an abundance of limestone and gypsum - one at Ma'sara (the oldest plant, in operation since 1900) and one each at Tura and Helwan (both opened in the 1920's). The Ma'sara and Helwan plants manufacture Portland cement. A new company, the Alexandria Portland Cement Company, which opened a plant at Alexandria in 1950 and obtains its raw materials from the easily accessible Mex limestone coastal ridge west of the city, produced 115,839 tons in 1951 - about ten per cent of the year's total output.

Favored by a high tariff since 1930 and a heavy demand for cement for local building construction and irrigation works, the industry has developed rapidly; the annual output was up to 364,000 tons in 1940. During World War II, when local building was drastically curtailed, production was reduced to only a sufficient amount to satisfy the needs of the Allied forces, but after the war was rapidly increased again. In October, 1952, the new government exempted cement exports from excise duties, with the result that production for export rose sharply; of 1,200,000 tons manufactured in 1952, 151,400 tons were exported to neighboring countries. Cement imports now consist only of special types not manufactured in the country.

In addition to meeting the local requirements for construction purposes, the cement industry supplies the material for a number of factories making tile, cement drainage pipes, and various reinforced concrete products.

Glass.

Glass blowing is an old handicraft in Egypt. Glass making, however, has never become a major industry, owing partly to the country's lack of certain types of sand, soda, and other basic ingredients, and partly to the domination of the market until recently by glass from Central Europe and Japan. This imported glass has been priced so low that in spite of a high tariff the local industry could not compete with it. Also, development of the industry received no official attention until 1934, when the government set up a modern workshop in Cairo for training in glass making.

Until recently the industry did little more than meet the needs of the rural population for such simple articles as the widely used kerosene lamps and chimneys and small tea tumblers. Even now, for such specialized products as tiles, pressed glass, illumination glassware, and optical lenses, the local market depends mainly on imports, as well as for a large part of the plate and window glass used.

Decreases in the tariff on imports of raw materials and increases on those of plate and window glass, put into effect in January, 1952, have done much to raise the industry to a position where it can compete with foreign products. This is particularly true of plate and window glass; in 1952, of the total of 11,900 tons of glass products manufactured, 4900 tons were of this type as compared with 9975 and 3975 tons, respectively, in 1951. In 1953 production of plate and window glass had risen to 7200 tons.

Glass making in factories is now carried on principally in a few fairly large plants in Cairo, Alexandria, and Damietta. Of these the Yassin factory in north Cairo is the most up-to-date. Its operations are based on Czechoslovakian techniques and its products are now comparable in quality to foreign-made ware of similar types. This factory was also the pioneer in the manufacture of plate and window glass. It imports, mainly from Belgium, the processed sand needed for some of its products. Sand suitable for similar processing occurs in the Sinai Peninsula, but the cost of preparing it would make it more expensive than the imported material.

Ceramics and Brick.

A good part of Egypt's annual output of pottery, stoneware, and brick is still handmade and by methods that differ little from those employed thousands of years ago. But machine manufacturing was introduced early in this century and has made such good progress that for some time it has met the country's requirements of red brick, tile, piping, pottery, and enameled fire clay sanitary and other household equipment. Most of the supply of refractory clay products, fine earthenware, and porcelain is still imported.

Pottery making is particularly well developed, favored as it is by an abundance of high-quality clay in certain localities in Upper Egypt. The clay beds at Qena, the famous "Qena pottery clay," are of an extremely fine, loess-like consistency, and the industry has its principal center there. The manufacture of the large porous jars used for cooling water by evaporation and of molasses jars is an old industry of the Qena potteries.

Brick making is an active industry throughout the country. Most dwellings in the rural areas are of sun-dried brick, handmade of clay or Nile silt. There is, also, some baking of brick in primitive kilns for the better class of village and town houses.

With the rapid growth of the urban population and the decline in the use of stone for building construction, a modern brick-making industry of considerable proportions has developed. Output in 1952 totaled 145,000,000 red bricks and 36,000,000 steam-processed sand-lime bricks. The industry is carried on mostly in fairly large establishments, chiefly on the outskirts of the Cairo-Giza metropolis, where the materials are easily accessible and the best market is close at hand.

Gypsum.

The gypsum industry in Egypt is small in relation to the wide distribution and richness of the deposits. The output, however, not only meets the local needs but leaves a surplus for export; of the production of 117,000 tons of gypsum and plaster in 1953, 18,804 tons were exported. Although there are numerous deposits of gypsum on the Red Sea and Gulf of Suez coasts, its exploitation there is mainly in El Ballah, west of the Suez Canal some 20 kilometers(twelve miles) north of Ismailiya, and in the Wadi Gharandal, on the west coast of the Sinai Peninsula, about 96 kilometers (160 miles) from Suez. Other deposits in the hills east and southeast of Helwan and in the vicinity of Lake Maryut are exploited for use in the manufacture of cement in nearby mills.

Vegetable Oils

The extraction of vegetable oils is an important industry in Egypt in terms of the contribution it makes toward satisfying the local requirements for household and industrial use, but it is carried on mostly in seven large modern plants equipped with hydraulic presses and it employs very little labor. The output is now about double the average of the years immediately preceding World War II. Of about 110,000 tons of oil now extracted annually, 95 per cent is from cotton seed. The remainder is in the form of linseed, sesame, peanut, and castorbean oil, for which the seeds are in part imported. Present production supplies all the country's requirements of cottonseed oil for food and soap manufacturing and a good part of the requirements of linseed and sesame oil. Imports of a variety of other oils for industrial purposes have been increasing for some time; In 1952, 28,500 tons, of which 37 per cent was coconut oil, were imported.

Cottonseed Oil.

The cotton crop yields annually about 600,000 tons of seed, of which nearly 500,000 tons go to the oil-extracting plants. Before World War II more than half the latter amount was exported. Now, it is all used in the country, and there have even been years recently when seed has been imported mainly from the Sudan. The annual output of oil is now around 100,000 tons, nearly a fourth of which is used for soap making.

Cottonseed cake is a valuable by-product. The annual output of about 400,000 tons is used for cattle feed principally on large farms, and elsewhere for fuel and to a lesser extent for fertilizer. Glycerine, another by-product, of which around 300 tons are produced annually, is used locally in the compounding of pharmaceutics, but the greater part is exported - 223 tons in 1952.

Sesame Seed Oil.

The annual consumption of sesame seed oil runs around 7000 tons. The local sesame crop of about 15,000 tons a year supplies about 75 per cent of this, and the remainder is extracted from imported seed. A by-product is an edible paste, teheena, which is also used in making halva (halawa teheeniya). Both are widely popular with the masses of the population.

Other Oils.

A small amount of olive and castor oil is extracted. The total area in olive trees is small, and most of the varieties grown are of poor quality from the standpoint of oil content. Most of the oil extraction is done in the Siwa and Dakhla oases. Crude hand presses are used, and the annual output is estimated at only a few hundred tons. Production has been slowly increasing since the 1930's, when the government imported thousands of trees of an Algerian variety exceptionally rich in oil in an effort to develop the olive oil industry. Imports of oil in 1952 amounted to only 516 tons as compared with 1299 tons in 1935.

Most of the castor oil used for medicinal and industrial purposes is extracted from beans imported from India. There is some local cultivation of the plant, but only on a very small scale.

The Dairy Industry

Of Egypt's estimated annual production of 20,000,000 qentars (900,000 tons) of cow and buffalo milk, about sixty per cent is used for butter making and twenty per cent for cheese. Most of the butter and cheese making is done by women in farm households and as a cottage industry in villages and towns. The large-scale manufacturing of dairy products, with modern machinery and modern methods of operation, has been introduced only recently. Of 230 establishments reported in the official statistics as manufacturers of dairy products in 1950, nearly half employed fewer than five persons. The larger establishments - there were 27 in 1950 with ten or more employees each and two with between fifty and a hundred - are in or near Cairo and Alexandria and a few of the other large urban centers of the delta, such as Kafr el Zaiyat, El Mansura, and Dam-

ietta. Most of them are operated by European residents, mainly Greeks and Italians. In spite of superior quality, their butter and cheese meet strong competition from the lower-priced country products brought in by peddlers.

The greater part of the country's milk supply comes from animals kept in the first instance for draft purposes. Large dairy herds are few, and herds of high-grade milk-producing stock fewer still. Consequently, considerable amounts of dairy products are imported - in 1952, 1514 tons of canned milk and cream and dried milk, 5048 tons of cheese, and 419 tons of butter. Even so, the per capita consumption of dairy products by the urban population is far below the minimun generally accepted as needed where so little meat is eaten as in Egypt.

Butter.

Made in the rural households throughout the country, butter is taken directly from the churn with little, if any reworking, and is packed for the market in barrels and other large containers. City as well as farm families convert practically all of it into a form of ghee, the semiliquid butter common in many parts of Africa and southern Asia and called by the Egyptians samna or masli. Some samna is also made in the large dairies and packed in tin cans for the market. The butter is boiled with salt over a steady, slow fire until the water is driven off, and then is skimmed and strained. When cooled the product is a thick granulated fat that keeps a long time without refrigeration. To the Westerner samna has a rancid, distasteful flavor, but the masses of the Egyptians use it as one of the commonest articles of their diet and in preparing practically all dishes.

Cheese.

Cheese making is as general a practice in the rural household as butter making. The product, also a part of the daily diet of most farm families, is a white cheese which may vary considerably in flavor and consistency from house to house. Large quantities are sold by country peddlers in the towns and cities. Both rural and urban families make a practice of storing a year's supply in earthenware jars for ripening. White cheese is also made in a few of the larger dairies and is the only factory-made cheese. In a move to stimulate the development of the industry, the government, in 1954, authorized the export of 200 tons of cheese to other Arab countries and the Sudan.

Milk.

Very little milk is consumed directly in either rural or urban households. The average annual per capita consumption, less than four kilograms (about 8 pounds) as compared with 161 kilograms (355 pounds) in the United States, is mostly for cooking. The greater part of the urban supply is brought in from nearby farms by peddlers who sell the milk from door to door. Owing to unsanitary methods of handling and delivery most urban dwellers boil the mild before using it. Inadequate transportation and refrigeration facilities would preclude any large development of milk distribution in the near future, even if the supply were adequate. Since World War II a few dairy shops have been opened in certain cities, but only in a few of these can pasteurized milk be obtained.

Canned and Preserved Food.

The canning and preserving of food is very much in its infancy in Egypt, although some progress has been made since World War II. A few establishments, most of them in Cairo, Alexandria, and Qaha (in Qalubiya province, north of Cairo), are now engaged in canning tomato paste, legumes and other vegetables, dehydrated onions, and fruit preserves. The dehydration of onions, a new industry with great potentialities owing to the country's heavy onion crop, is developing rapidly. In 1953 exports of dehydrated onion flakes and onion powder amounted to 2621 tons, most of which went to the United States. That year production of canned vegetables was 212 tons and of tomato paste 476 tons as compared with 144 and 195 tons, respectively, in 1950.

The vegetable-canning industry is handicapped by the fact that the local market is extremely limited, owing to cultural as well as economic reasons. Canned products are much more expensive than fresh vegetables, and the majority of the people finds them distasteful. Dried legumes, always available in large quantities, figure much higher in the daily diet of a large proportion of the population than do any other vegetables, and the drying of vegetables and making of pickles and fruit preserves is a common home practice. Furthermore, the products of the local canneries meet strong competition from imported canned goods. Although higher priced, these are preferred because of their generally better quality.

The small meat-preserving industry is mainly carried on by Italians and Greeks and caters to the foreign population. For the Moslems, who eat only fresh meat, deliveries are made daily to the meat shops, and even refrigeration is little used. Fish, also, is mostly eaten fresh, and owing to the lack of refrigerated transportation, there is little distribution at any great distance from the fishing grounds. The only preserving of fish is by dry salting, for which Rosetta is the principal center.

Salt.

The manufacture of salt is an old and well-established industry in Egypt. The annual output is between 500,000 and 600,000 tons, of which 200,000 to 300,000 tons are exported, chiefly to Far East countries. The industry is carried on principally by two companies - the Egyptian Salt and Soda Company with works at Alexandria and in the Wadi el Natrun and the Port Sa'id Salt Association, Ltd. (The former has now been taken over by the government.) The latter operates on the coastal marshes east of the Suez Canal. Production there and at Alexandria is by solar evaporation from sea water. At the Wadi el Natrun plant the salt is extracted from the natural soda (natron) deposits bordering a chain of salt lakes in a depression in the desert.

Starch and Glucose.

Starch manufacturing has for some time satisfied the local demand. The output in 1953 was 5023 tons, of which 65 per cent was made from rice and the remainder from corn. The rise in the price of sugar in recent years has resulted in a rapid development of the manufacture of glucose for use in confections and pharmaceutical preparations. Broken

rice is the principal raw material used. Production in 1953 was 7690 tons, and supplementary imports, which amounted to 2186 tons in 1950, fell in that year to only 267 tons.

Macaroni.

The local market for macaroni and similar flour paste products gets nearly its whole supply from local manufacturers. In 1953 production was 17,300 tons, and supplementary imports amounted to only 627 tons. A small part of the output is now being exported to Middle East markets - 94 tons in 1953.

Food Packing.

There is a fairly large business of repacking food imports in the small packages made necessary by the limited buying power of the great majority of the population. Coffee, tea, cocoa, and spices are the principal commodities involved. The packaging of coffee and tea, which are imported in large quantities in bulk, is a particularly active branch of the industry, with large packing houses at the entry ports of Alexandria and Port Sa'id and at Cairo, the principal distributing center.

NOTES

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THE PRESENT TRANSPORTATION NET

A map of the railroad and road nets and navigable waterways of Egypt's Nile valley and delta and the Suez Canal Zone gives the impression of a region remarkably well served with transportation routes. Egypt is served well enough for its present state of industrial development,[1] but the transportation net as a whole is weak, poorly coordinated, and inadequate for future development.

Long neglected in favor of the government-owned, revenue-producing railroads, the roads and inland waterways are most in need of improvement. However, a few gaps in the railroad net also need to be filled. Between the southern terminus of the valley railroad at El Shallal and the northern terminus of the Sudan railroad at the border town of Wadi Halfa, a distance of 219 miles (345 kilometers.), the only present connection is by river steamer and desert road. The need of direct rail connections between the ports of Alexandria and Port Sa'id and between the latter port and the present delta network is also frequently mentioned in connection with reclamation of the delta wastelands. Trunk lines to new manufacturing centers, mining sites, and large-scale land reclamation projects, and some extension of the present main-line double tracking will also be required.

Road Conditions and Plans for Improvement

The road system, of which over eighty per cent consists of what are designated in Egyptian statistics as "packed-earth roads," was adequate as long as the roads were used chiefly for carrying the farmers' crops by cart or pack animal to nearby railheads, river ports, and village markets. Until recently there has been no great demand for, or need of, motorable roads. The lack of such roads may have been partly responsible for the slow development of motor traffic in Egypt. Once since World War II has there been any significant importation or local assembly of motor vehicles.

Since the 1952 revolution, however, new roads have generally received priority over railroad construction - notably in areas where reclamation was in process or planned, and where farming and industrial districts needed links with existing railroads and navigable waterways. A fund of £E 9,000,000 (nearly $26,000,000) was allotted to carry out a program of road building to be completed by the end of 1957. This included surfacing 900 kilometers of earth roads in the valley and delta, widening about 950 kilometers of the present surfaced roads, leveling 1000 kilometers of earth roads along the Red Sea, constructing earth roads in sections of Upper Egypt still under basin irrigation, rebuilding a number of important bridges, and improving road connections for motorbus traffic.[2]

Prospects for Improving Inland Navigation

Both the Nile and navigable canals play an important role in carrying cargo and passengers. Whether much can be done to improve the irrigation and drainage canals for navigation is questionable. Nor will it be easy to eliminate the hazards and delays that harass Nile shipping during the long annual low water period, because water for irrigation must then be given first consideration. But great improvement could be affected on the Nile by systematically scheduling bridge and barrage openings and by installing better mooring and cargo-handling facilities.

Inland navigation is subject to little control. A 1941 law set up regulations for boat operations and freight and passenger charges. The purpose of this law was, however, to reduce competition with the railroads rather than to aid the boat owners. No serious effort at enforcement was ever made.

Shortly after the coup d'état of 1952, a Permanent Committee on Navigation was charged with drafting an overall navigation and shipping policy. This committee established regulations for boat operation and schedules for the opening of bridges and barrages, shipways and locks; drafted plans for extensive improvement of the Nile anchorages and moorings and facilities for loading and unloading; and, it was reported in 1955, authorized an allotment of £E 5,195,000 ($14,809,650) for the repair and replacement of steam and motor vessels and the development of additional fleets.

There has been much discussion of improving navigation, but no work except on the much-used Mahmudiya Canal, between Cairo and Alexandria. The reconstruction of this canal was begun in 1938, but in spite of large allotments of funds to the project, little progress was made on it until after 1952. Early completion of what will be virtually a new canal is expected.

THE RAILROADS

Ownership

Of the 3499 miles (5633 kilometers.) of railroads, exclusive of the short lengths of industrial lines, 3282 miles are now government owned. Known as the Egyptian State Railways, these government-owned lines are operated by the Railways Department of the Ministry of Communications. Except for the 121-mile line from the main valley line to the Kharga Oasis and a 610-mile system in the delta built and operated until recently by the Egyptian Delta Light Railways, Ltd., they are broad gauge (4 ft., 8 1/2 ins., or 1.535 meters).[3]

In addition to the railroads serving the general public a total of 95 miles of lines serve industries and industrial districts: the thirty-mile line to the soda and salt works in the Wadi el Natrun, west of the Nile delta, recently taken over, along with the works themselves, by the government; lines of 31 and 23 miles on the Red Sea coast owned, respectively, by the Egyptian Phosphate Company and the Italian Phosphate Company; and a line consisting of eleven miles of railroad and seven of aerial cableway between the port of Abu Zenima on the west coast of Sinai and the manganese mines of the Sinai Mining

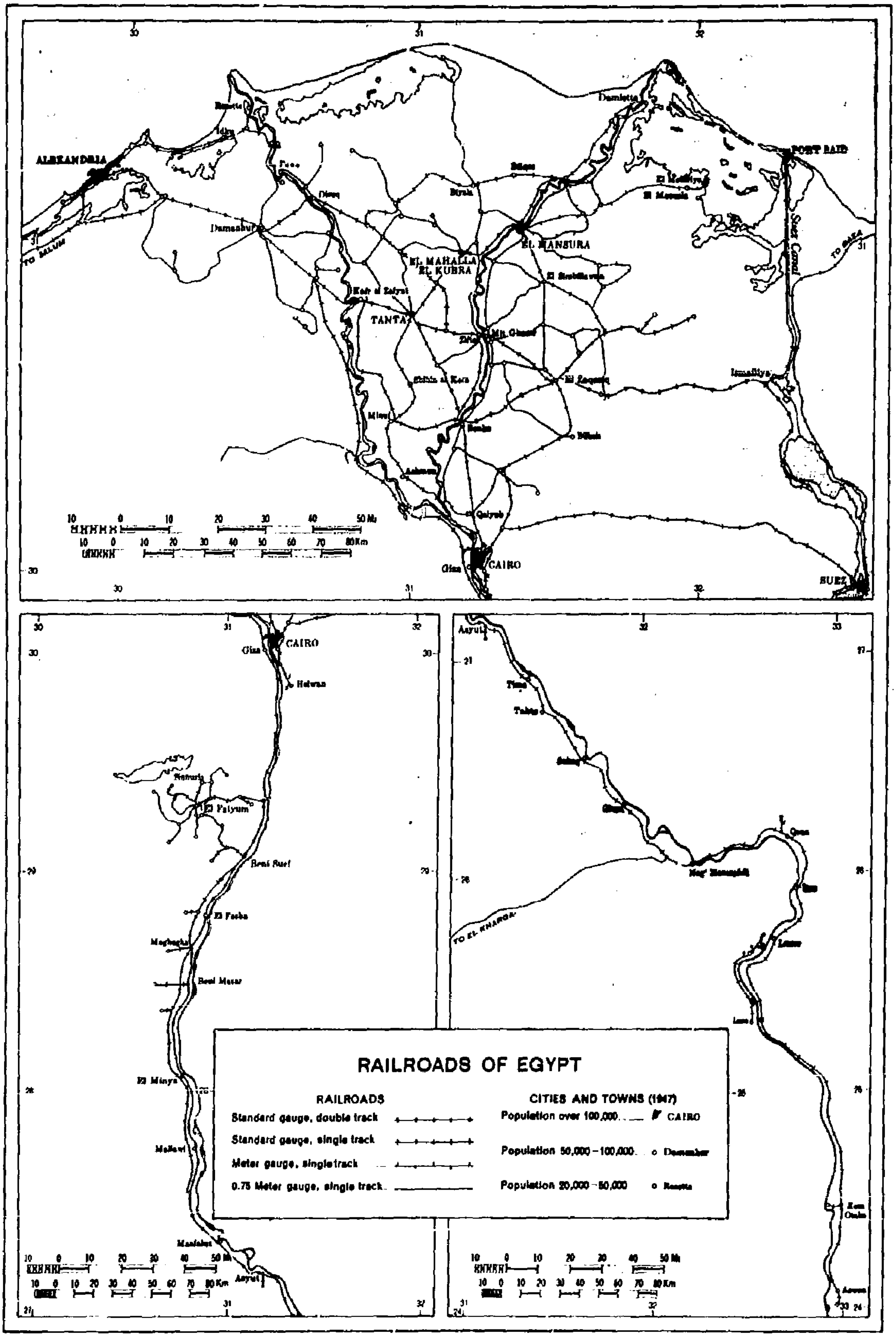
Company, owned and operated by the company. The Alexandria District Transport Administration also operates a twenty-mile system to service the city's docks and warehouses, and the Cairo Electric Railways and Heliopolis Oasis Company has a nine-mile electrified line connecting Cairo with the agricultural district northeast of the city that has developed on and around the site of the ancient city of Heliopolis.

The only other lines that were originally privately owned are 158 miles of meter-gauge railroad in the northern part of the delta between El Mansura and Lake Manzala built by a French company, the Société Anonyme de Chemins de Fer de la Basse-Égypte, under a concession granted in 1895 and expiring in 1964; and 99 miles of 2 ft. 6 ins.-gauge in the Faiyum built by a British company, the Faiyum Light Railways Company, under a concession granted in 1897 and expiring in 1968. [4]

Development of the Rail System

Railroad construction began early in Egypt. Before the end of the Governor-Generalship of Sa'id (1854-1863) railroads had been built to connect Cairo with both Alexandria and Suez. The Cairo-Alexandria line was opened in 1854; the Cairo-Suez line, built with a view to restoring the ancient overland trade route between the Mediterranean and the Red Sea, only two years later (see Chapter 11, The Suez Canal).

Ismail (Governor-General, 1863-1867, and Khedive, 1867-1879), as part of his great schemes for agricultural and industrial development (notably of his own enormous estates), added many of the basic lines of the present system. These included a second line from Cairo to Suez by way of Benha, Zaqaziq, and Ismailiya completed in 1868; the first section of the valley railroad, a 161-mile line from Cairo to El Roda, 21 miles south of El Minya, completed in 1867; and the branch line from El Wasta into the Faiyum, opened as far as El Faiyum in 1869 and extended fifteen miles farther the following year to the Khedivial estates at Abuxah. (The second line into the Faiyum, which joins the main line at Beni Suef, was built as far as Lahun early in the present century and extended to El Faiyum shortly before World War II.) Ismail also laid a total of 326 miles of auxiliary railroads in the lower valley for his own use, mainly to link his sugar plantations with his sugar mills. These were purchased by the government in 1906 and were subsequently largely abandoned. The valley trunk line was completed in sections: to Asyut in 1890; to Sohag in 1892; to Nag' Hammadi, where it crosses to the right bank of the river, in 1896; to Qena in 1897; and to its terminus at El Shallal, five miles south of Aswan, in 1898. The last two sections were built by a private company, the Société de Chemin de Fer de Qena-Aswan, and were leased to the Egyptian State Railways until the expiration of the company's concession in 1975. The Luxor-El Shallal section, originally narrow gauge, was converted to the standard gauge of the government lines in the late 1920's. The 121-mile, narrow-gauge line connecting the Kharga Oasis with the main valley line a few miles north of Nag' Hammadi, opened for traffic in 1908, was built by a private company, the Corporation of Western Egypt, and was purchased


RAILROADS OF EGYPT
RAILROADS
Standard gauge, double track
Standard gauge, single track
Meter gauge, single track
0.75 Meter gauge, single track
CITIES AND TOWNS (1947)
Population over 100,000
CAIRO
Population 50,000 - 100,000
Population 20,000 - 50,000
ALEXANDRIA
TO SALUM
EL MAHALLA
EL KUBRA
EL MANSURA
TANTA
PORT SAID
Suez Canal
TO GAZA
CAIRO
Giza
SUEZ
Qalyub
TO EL KHARGA

by the government shortly after its completion.

The railroad between Port Sa'id and Ismailiya was originally a light steam tramway built by the Suez Canal Company and completed in 1896. To ensure direct rail connection between Cairo and Port Sa'id, the government acquired this line in 1906, agreeing to reimburse the Suez Canal Company by annual payments until the expiration of the company's concession 1968 - an agreement which, of course, ended when the Egyptian government seized the canal and assumed administration of it on July 26, 1956.

The railroad extensions eastward and westward from the delta were for the most part built in response to urgent wartime requirements. The line from El Qantara, on the east bank of the canal, to the border town of El Rafah was constructed during World War I, when the major operations of the Anglo-Egyptian Expedition were in the area between the Suez Canal and Palestine. The railroad running westward from Alexandria along the Mediterranean was begun by Ismail, who built a light railroad from Alexandria to his estates in the vicinity of Maryut. Later the Khedivial Trust, which managed the estates of the royal family until their confiscation by the present government, converted it to standard gauge, and, in 1905, when work on this extension was halted, it had been completed to within about 37 miles of Mersa Matruh. In 1914 the government purchased the line and before the outbreak of World War II had extended it to Mersa Matruh. The continuation to Salum, on the border, was built during the war by the Allied forces, but this section has been abandoned, at least temporarily. So also has the line of about 93 miles that was constructed during the war to connect the Red Sea petroleum port of Quseir with the valley railroad at Qena. Its purpose was to provide a means of bringing out petroleum from the wells of the Red Sea coast in case access to the refineries at Suez should be menaced by the Axis powers.

It will thus be seen that the major part of the present Egyptian State Railways system was completed during the British occupation. The 673 miles built after Egypt became independent in 1921 are mainly connecting and feeder lines to the new irrigated areas of the delta and new industrial centers (see Table 1). A considerable part of the 408 miles built after 1940, however, was added during World War II to help move supplies for the Allied forces.

Table 1 - Post-Independence Development of Egypt's Railroad Mileage

	Egyptian State Railways	Egyptian Delta Light Railways	Chemins de Fer de la Basse-Égypte	Faiyum Light Railways	Total
1925	1,959	604	154	99	2,816
1930	2,084	613	160	99	2,956
1935	2,208	626	158	99	3,091
1940	2,224	627	158	99	3,108
1945	2,541	610	158	99	3,408
1950	2,632	610	158	99	3,499

The more important sections of the main trunk lines of the Egyptian State Railways are double tracked. These are the valley line as far south as Asyut; the short line connecting the Helwan industrial district with Cairo; the main Cairo-Alexandria line by way of Benha, Tanta, and Damanhur; and the branches from Tanta to the industrial centers of El Mahalla el Kubra and El Mansura and from Benha to Ismailiya, Suez, and Port Sa'id by way of Zaqaziq.

Upkeep and Replacement

As long as the British controlled Egypt, the railroads were one of their chief concerns, and the government-owned system was in general well maintained and operated on schedule. But for a number of years preceding World War II there was neglect of track and roadbed maintenance and of the repair and replacement of rolling stock. During the war, although higher freight rates and passenger fares and heavy increases in both freight and passenger traffic brought the system as a whole great profits, tracks and rolling stock were permitted to deteriorate. Owing mainly to their poor condition, but partly also to the shortage of fuel, these railroads became progressively less able to meet the wartime demands on them. Indeed, there were times when farmers would have had difficulty in getting their crops to market and obtaining fertilizers and other necessary supplies, and towns and cities would have experienced serious food shortages, had it not been for the large tonnage of Nile shipping available, especially of sailing vessels.

Since the war the government has spent heavily on track repair and the renovation and replacement of rolling stock. There has been a large-scale conversion from coal-burning to oil-burning locomotives, so that more than eighty per cent of the locomotives on the Egyptian State Railways are now oil burners, as compared to only one per cent in 1939, and the annual saving in fuel costs is estimated at £E 1,250,000 (nearly $3,600,000).[5] The present government regards further renovation as essential to the success of its ambitious program for agricultural and industrial development, and has announced that about 120 steam yard engines are to be replaced by diesels and 150 passenger coaches and 2000 freight cars of various types are to be purchased or locally manufactured.

Traffic and Profits

Until well into World War II the government owned railroads operated at a substantial profit in most years. The profits, however, began to decline seriously after the war, owing mainly to the heavy expenditures for repair work and the purchase of rolling stock, although for a time there was also some falling off in receipts from both freight and passengers. At that, the statistics indicate that receipts have been paying all costs and still returning a small profit. The all-time low for net profits was for the year 1948-1949, when they fell to £E 128,249 (about $370,000), but the following year they rose to £E2,009,086 (about $5,766,000), as shown in Table 2.

Table 2 - Railroad Equipment, Traffic, and Operating Expenses, 1950

	Egyptian State	Delta Light	Basse-Égypte	Faiyum Light
Locomotives				
Diesel	641	--	24	16
Steam	80	164	23	9
Passenger coaches	1,069	355	73	57
Freight cars	18,390	1,718	437	241
Fuel consumed (tons)				
Mazout oil	539,054	--	--	254
Coal	25,185	16,772	1,160	--
Solar oil	--	--	--	315
Passengers (000s)	57,537	22,678	3,793	1,612
Passenger mileage (000,000s)	1,369	122	n.a.	n.a.
Freight (000 tons)	5,972	797	109	60
Livestock (000s)	541	--	54	2
Receipts (£E 000s)	13,368	662	135	49
Expenses (£E 000s)	11,359	533	117	52

n.a. - not available

Passenger traffic is remarkably heavy. On the Egyptian State Railways it amounted to about 1,369,000,000 passenger miles for the year 1950, and receipts from passenger fares were £E 5,009,258 (about $14,376,570) as compared with £E 8,359,140 ($23,991,731) from baggage (£E 1,892,921) and from feight and other handling charges (£E 6,466,219).

First-class passenger coaches are available on trains on all the main lines of the Egyptian State Railways and have a reputation for comfort at low cost. Express trains make the 545-mile run between Cairo and Aswan in 14.5 hours, or at an average speed of 37.5 miles per hour, and the first-class fare is £E 5.645 ($17.20), or a little over three cents a mile. Air-conditioned coaches, both first and second class, are available on all the main lines, and sleeping cars on the Cairo-Aswan line. About ten per cent is added to the first-class fare for air-conditioned coaches and 44 per cent for sleeping-car berths. Diesel trains, on which all first-class coaches are air conditioned, are operated on the main Cairo-Alexandria line. Second- and third-class fares are extremely low - one-half and one-third the first-class fare, respectively, on the Cairo-Aswan run. In 1950, 21 and 68 per cent of the total fares collected on the Egyptian State Railways were from second- and third-class passengers, respectively.

The Light Railway Systems

Considering their locations, it might be inferred that the principal function of the three light railway systems is to carry farm products to the main trunk lines and bring back supplies to the districts they serve. They were constructed chiefly for that purpose, but on all of them passenger fares actually bring far greater returns than does the transport of freight and baggage. (See Table 3.) The Egyptian Delta Light Railways and the Société Anonyme de Chemins de Fer de la Basse-Égypte operate both first- and third-class coaches, the Faiyum Light Railway third-class only.

Table 3 - Receipts on Egypt's Light Railroads, 1949-1950

in Egyptian Pounds

	Egyptian Delta Light Railways	Société Anonyme de Chemins de Fer de la Basse-Egypte	Faiyum Light Railways
Passengers	404,373	91,252	30,663
Freight and baggage	257,656	43,466	18,859
Net profits	131,710	6,077	928

INLAND WATERWAYS

Although exact figures on waterway traffic are not to be had because such traffic is practically unregulated, the annual tonnage of waterborne freight probably averages at least 20 per cent more than that carried by the railroads. There is much passenger travel on all types of vessels, especially for short journeys.

Water transport in Egypt is still strongly influenced by tradition. For centuries flat-bottomed craft, of types that today differ little in design and rigging from their ancient forebears, have sailed up the Nile with the prevailing northerly winds and floated down with the current. These craft are the most common carriers on the Nile - they are estimated now at some 15,000, of from five to thirty tons. Their pointed lateen sails, thrusting above the banks of the larger irrigation and drainage canals, are a striking feature of the rural landscape of the Nile delta. Northward on the Nile they carry cotton and cottonseed, cereals, and other farm products to the down-river markets, sugar cane to the crushing mills, raw sugar to the country's only refinery at El Hawamdiya, and pottery from the Qena kilns. Southward their principal cargoes are such bulky commodities as fertilizers, coal, and cement, but they also transport many items of general merchandise.

Complementing this sailing fleet there are some 400 steam or motor vessels carrying freight or passengers, or both, 600 tow barges, upward of 290 tugs, and numerous motor launches. Most of these are owned by twelve companies, of which the Misr Company for Transport and Navigation, one of the many organizations that bear the Misr name (see Chapter 9, Manufacturing) has the largest fleet. A considerable number, however, are individually owned and operated.

The Navigable Canals

The 962 navigable miles (1552 kms.) of the Nile from its mouth to the southern border of the country have been navigable from time immemorial. Some 1112 (1790 kms.) of navigable irrigation and drainage canals were added gradually as the irrigation system was developed. Canals are much more used for transportation in the delta than in the valley (see Table 4). Of the 865 miles of navigable canals in the delta, 208 are drainage canals, whereas in the valley none of the drainage canals are large enough to be of any value for navigation. In the valley, the entire 247 miles of navigable canal indicated in the table are accounted for by the Ibrahimiya Canal and its extension into the Faiyum by way of the Bahr Yusef. The latter is an old watercourse which took off directly from the Nile before the Ibrahimiya Canal, Egypt's longest and largest, was dug. Its head in the Nile has now been closed, and it is fed entirely by the canal. In the delta the major navigable irrigation canals are: the Mahmudiya Canal, oldest in Egypt's present canal system; the El Beheira, Minufiya, and Taufiqi canals, which take off from the delta branches of the Nile immediately above the Delta Barrage; and the Ismailiya Canal, which branches off from the Nile a short distance north of Cairo to carry fresh water to the Suez Canal towns.

Table 4 - Mileage of Navigable Canals Classified by Width

Width at entrance	Delta	Valley	Total
Less than 5 meters (16.4 ft.)	44	--	44
5-10 meters (16.4-32.8 ft.)	155	--	155
More than 10 meters (32.8 ft.)	666	247	913
Total	865	247	1112

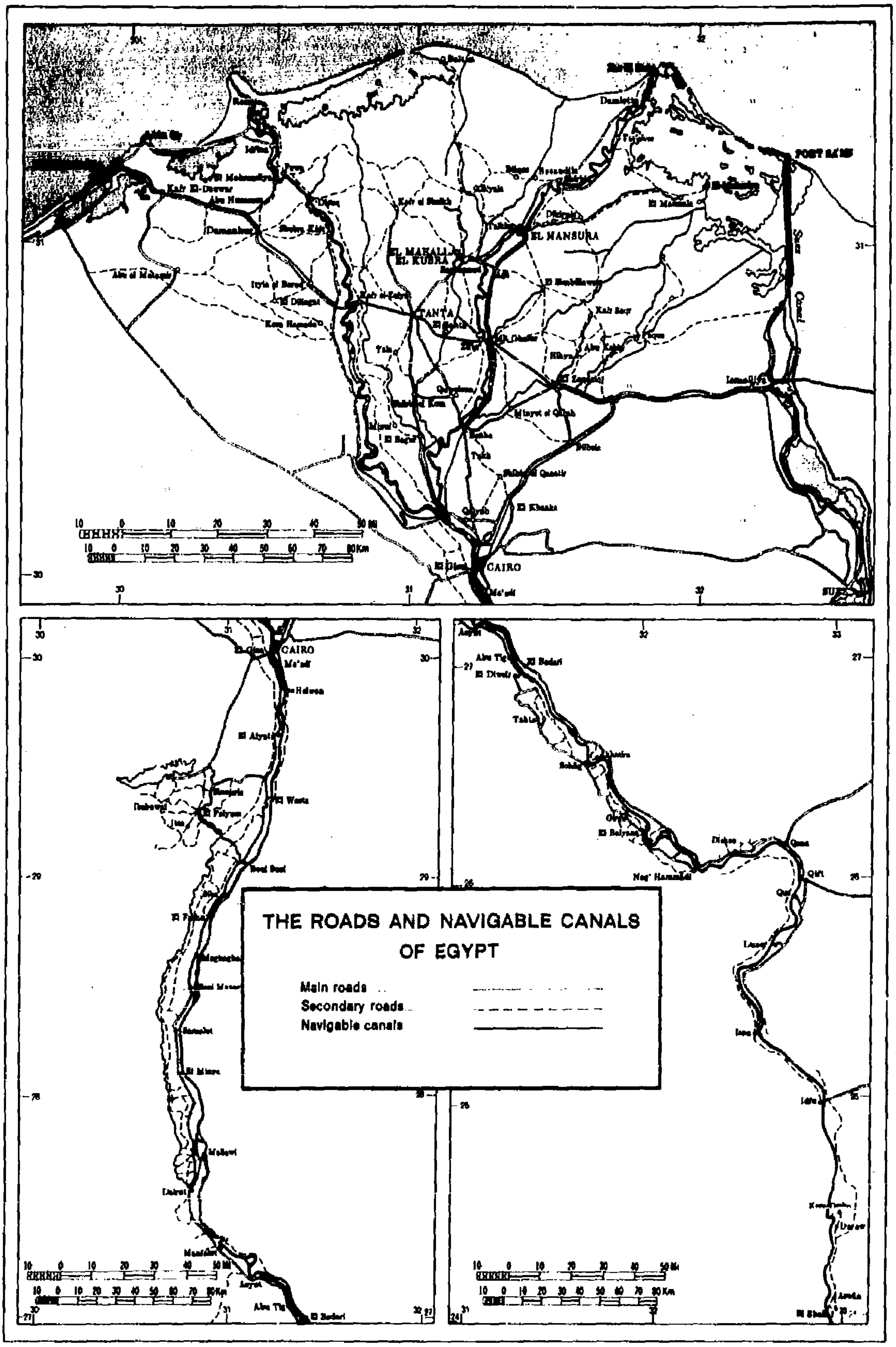
Of these canals only the Mahmudiya was built expressly for navigation as well as for irrigation. It was opened by Mohammed Ali in 1820 for the triple purpose of providing a direct waterway between Cairo and Alexandria, furnishing his newly-established cotton plantations with water for summer irrigation, and supplying Alexandria with fresh water. The Ismailiya Canal, completed in 1860, is navigable for small craft as far as Ismailiya. The three others, the principal irrigation canals of the delta, are wide and deep enough to be navigable for vessels of considerable draft during at least a considerable part of the year.

There has never been much interest in the development of water transportation as a cheap and efficient means of carrying freight and passengers, and it was given only the barest consideration during the development of the irrigation system. The great canals were dredged only to make them large enough to carry the water that they were to be called on to handle, though many of them could have been easily navigable at little, if any, additional cost.

The Nile as a Waterway

Although the Nile is navigable for its entire length in Egypt, it is not equally so at all times and in all sections. The river is least obstructed by man-imposed obstacles when at the height of its flood and flowing freely through the Aswan Dam and the barrages below it, but it is then a rushing stream with a velocity that may reach six miles or more per hour, and southbound sailing vessels may have difficulty in beating against it.. During the long low-water season, when the Aswan Dam is releasing only a prescribed amount of water daily, shipping must take its chances at getting through the barrages. Navigation may also be completely blocked by sandbars that appear when the flood water has subsided.

The Aswan Dam and the Nile barrages keep much of the Nile deep enough during the low-water period for vessels of considerable draft. Shipways or locks were also built in the barrages and locks in the Aswan Dam, but their use for shipping is necessarily subordinated to the primary purposes of the barrages and the dam - namely to maintain the flow of water into the irrigation canals with the result that the passage of vessels through them may be delayed for hours or even days.


THE ROADS AND NAVIGABLE CANALS
OF EGYPT
Main roads
Secondary roads
Navigable canals
EL MANSURA
EL MAHALLA
EL KUBRA
TANTA
CAIRO
PORT SAID
Suez Canal
Damanhur
Kafr El-Dawwar
Beni Suef
Mallawi
Qena
Nag' Hammadi
Sohag
El Badari
Abu Tig
Asyut

On the Nile itself many embankments and jetties have been built to prevent overflow in time of flood and to deflect the current where it threatens to undercut the banks. The sole purpose, however, has been to protect the farm land, and instances are few in which this work has improved the navigability of the river. The jetties, indeed, may produce sandbars that make navigation extremely difficult or even completely halt it during the low-water period. Only rarely are any of these sandbars dredged.

Both because the navigability of the Nile is so unpredictable and because little has ever been done to regulate water transportation, there is only very limited scheduled service on the Nile and none on the canals. About the only vessels that operate more or less regularly are a few that carry passengers and farm produce between Cairo and the Delta Barrage and the line that runs the 210 miles between El Shallal, the southern terminus of the valley railroad, and the northern terminus of the Sudan railroad at Wadi Halfa. Otherwise inland water transportation usually involves much waiting by cargo for vessels and by vessels for cargo. Of the cargo boats, the best managed and most dependable are the company-owned steam barges, particularly those of the Misr line.

Waterway Problems

Since much of the Nile valley and delta is adequately served by railroads at present and since railroads represent a large investment of public funds, it is unlikely that a great deal will be done to improve the inland waterways and regulate traffic on them unless agriculture and industry should be developed to a point where rail and water transport are recognized as properly complementary, rather than as competitive. Except for the Mahmudiya, which was originally designed for navigation as well as irrigation, the main irrigation and drainage canals cannot easily be adapted for navigation. Extensive widening, deepening, or straightening of canals would be a heavy drain on the public funds, would sacrifice much valuable farm land, and might well throw the whole irrigation system out of balance.

At all events, there is obvious need for a uniform schedule of freight rates and passenger fares on the Nile River and the canals; for some system of freight agreement between the railroads and the water carriers so designed that each will be allotted the cargoes it can handle most cheaply and efficiently; for improvement of the low-water Nile; for a schedule of bridge and barrage openings that will eliminate as far as possible the unpredictable delays that are a principal cause of the present undependability of inland water shipping; and for the provision of better mooring and loading and unloading facilities.

A few of the large navigation companies have contracts for the annual transportation of certain amounts of certain commodities. These have been secured through interlocking directorates or shareholder influence in government bureaus rather than through any general plan for the allotment of cargoes. The powerful Misr Navigation Company carries export cotton from the valley to Alexandria for cotton exporters who are among its shareholders. Fertilizers are carried to Upper Egypt by a number of the inland transport companies

under contract with the Banque du Crédit Agricole and other importers. A group of companies also has a contract with the Ministry of Supply to carry imports of wheat and other cereals from Alexandria to Cairo. [6]

ROADS

The roads designated in Egypt as first class or main roads are usually described as macadamized. Actually, only the major trunk roads are of crushed-stone construction, and the remainder are of tar macadam (a mixture of concrete and tar) or in some sections are tarred only. The clayey soil, if left unstirred, becomes baked to an almost brick-like consistency under the generally rainless skies and tar macadam stands up well on it under most of the traffic that Egypt's roads are called upon to bear. Only in the delta does it ever rain hard enough to make roads impassable, and even there such storms are phenomenal (see Appendix 2, Climate).

Table 5 [7] shows how late road surfacing of any sort came to Egypt; of the present mileage of macadam or tar-macadam roads by far the greater part had its first surfacing during and following World War II. The reason for this recent development is not far to seek. Table 6 indicates that between 1940 and 1953 the number of motor vehicles in Egypt was considerably more than doubled and the number of motor trucks and buses more than quadrupled. True macadam roads are still limited to the main trunk line between Cairo and Alexandria, by way of Benha, Tanta, and Damanhur; the Tanta-Damietta road; and the road from Tanta to Ismailiya by way of Zaqaziq. The main road in the valley has little heavy traffic, since it is paralleled by both railroad and river. Consequently, although it is macadamized for the 481 miles (776 kms.) between Cairo and Isna, the macadam is lighter and the road narrower than are the delta trunk lines. South of Isna it is tar macadamized or tarred only.

Macadamized or tarred roads do, however, now connect all the towns and cities of the valley and the more important ones of the delta and the Suez Canal Zone. The most serious gaps - as also with the railroad net - are the lack of any direct connection between the ports of Alexandria and Port Sa'id and between them and the towns of the northern part of the delta.

Surfaced Roads

Cairo and Alexandria are connected by two good roads. The macadamized road by way of Tanta carries the heaviest traffic in the country. It is a convenient route for trucking cotton to the export warehouses at Alexandria. By branch roads from Tanta, it links Cairo and Alexandria with the industrial towns of El Mahalla el Kubra, El Mansura, and Damietta, and provides a fairly direct route between Alexandria and Ismailiya, where it connects with the Suez Canal road between Suez and Port Sa'id and with a tarred road that cuts across northern Sinai to El Arish and Rafah. The other route, considerably shorter, is a 123-mile tarred road, the so-called "Desert Road" cutting straight across the desert between Cairo and Mex, a western suburb of Alexandria. It is much used for through traffic, especially by private cars. Midway on it is a Rest House where refreshments are served, mechanics are in attendance, and gasoline and oil can

Table 5 - Development of Egypt's Road Mileage

Year	Macadam or tar macadam	Packed earth	Total
1925	41	3, 036	3, 077
1930	204	3, 780	3, 984
1935	253	4, 304	4, 557
1940	793	5, 436	6, 229
1945	1, 154	7, 143	8, 297
1950	2, 125	8, 000	10, 125
1952	2, 437	8, 375	10, 812

Table 6 - Motor Vehicles in Egypt

Year	Private cars	Taxicabs	Trucks	Buses	Total
1935	17, 906	3, 898	2, 439	1, 093	25, 336
1940	25, 119	4, 098	2, 923	1, 325	33, 465
1945	22, 451	4, 944	5, 209	1, 629	34, 233
1950	49, 926	9, 948	14, 443	3, 512	77, 829
1953	57, 517	11, 915	14, 566	4, 894	88, 992

be had. A popular bus line, described in the official tourist handbook as operating Pullman and De Luxe buses, makes the one-way trip over this road in about 3 1/2 hours.

Cairo also has two main road connections with the Canal Zone and Port Sa'id. The most direct route to Port Sa'id (134 miles) begins at Cairo with a well-kept tar-macadam road, which runs northeastward from the city to join the macadamized Tanta-Ismailiya road a short distance east of Zaqaziq, and continues by this road to Ismailiya. Here it meets the road to Port Sa'id - also tar-macadam. The longer route first cuts straight across to Suez by a 72-mile tar-macadam road; thence it reaches Ismailiya by a 101-mile road which, though narrow and tarred only, is well maintained because of its use in connection with Suez Canal operations. The valley route from Isna to Luxor is a tar-macadam road of good width and kept in fairly good repair. From Luxor to Aswan, the road is tarred but this section is little used by motor vehicles, and the tarring is only infrequently renewed. This also applies to the road that follows the Red Sea coast from Suez to Quseir and to the Qena-Safaga, Qift-Quseir, and Idfu-Mersa Alam roads across the Eastern Desert. The last three are old desert tracks that were surfaced during World War II to provide access to the Red Sea in case the concentration of Axis naval forces in the eastern Mediterranean should block the Suez Canal to Allied shipping. Since little use was made of them during the war and practically none has been made since, they have not been kept in repair. The same is true of the coastal road westward from Alexandria, which was extended to the border during the war but has not been kept up west of Mersa Matruh.

The Earth Roads

All the so-called secondary roads are earth roads, and most of them are laid out on canal embankments. Everywhere they stand well above the fields, forming conspicuous features of the rural landscape, with their borders of date palms and other trees. Although these earth roads are usually referred to in Egypt as farm roads, the majority of them serve the farmer only in the sense that his produce is carried over them from the various collecting points to town or city markets or to rail or main-road shipping stations. Few of the rural villages can be reached by motor vehicles or in fact by wheeled vehicles of any sort. With land so precious, travel is mainly by paths no wider than is needed for pack animals to pass single file. Most of the paths follow distributary canals and ditches and are surfaced with the mud cleared from these waterways. As long as there was little road traffic in Egypt except by animal-drawn vehicles and pack animals, the roads now classed as secondary served well enough, packed as they were by years of use and baked hard by the sun. Although those in the delta are occasionally severely damaged by rainstorms and those elsewhere are sometimes washed out by the overflowing of canals during excessively high floods, they are easily put back into condition.

Even after private automobiles and motor trucks and buses began to appear in considerable numbers, the government was reluctant to encourage their use by providing suitable roads. Even when the number of vehicles so increased that the government was forced to begin the surfacing of some of the most-used roads, it

imposed such heavy taxes on vehicles, parts, and gasoline and such high charges for road use that these have long exceeded the cost of construction and upkeep; in 1950 receipts for taxes and other charges amounted to around £E 8,000,000 (nearly $33,000,000) or double the government's expenditures for roadwork that year.[8]

In spite of the considerable increase in motor vehicles in recent years, horse carriages and wagons handle much of the transportation of people between the towns and cities and the nearby rural communities and even in the towns and cities themselves, and these and pack animals and push carts and barrows do much of the short-haul transportation of goods. In fact, their use appears to be increasing rather than decreasing if the official figures on their number can be accepted as reliable; the 3956 horse carriages, 42,879 wagons, and 17,214 push carts reported as in use in the official statistics for 1950 were substantially more than were reported for these same categories in 1945. On the streets of even the large cities one sees many of these primitive carriers mingled with motor vehicles, and only in the most modern sections does motor transport predominate.

AIR TRANSPORT

Lying as it does on the major air routes between Europe and the Middle and Far East and also between Europe and East and South Africa, Egypt has come to be a focal point for air navigation and thus to hold a position not unlike that which it held when ancient Alexandria was a great transit port between the Mediterranean and the East.

After 1919, when the British had begun regular air communication with India, East and South Africa, and Australia after the end of World War I, it was logical that Cairo should be used as an intermediate port. Other European air-navigation companies soon followed suit, and by the mid-1930's the Almaza Airport, built by the British on the outskirts of the residential suburb of Heliopolis, a few miles northeast of Cairo, was one of the World's most important centers of international air transport. Since World War II, however, it has served chiefly as the principal center for the internal flights of the local air navigation companies. During World War II United States Army Engineers built a second airport nearby as a center for Allied air operations. Following the war this port, which had been named Payne Field by the Americans, and the adjacent Huckston military camp were turned over to the Egyptian government. Called at first the Farouk I Airport and, after the coup d'état of 1952, the Cairo International Airport, it has been reserved since March, 1949, for international traffic. The field has an area of about 2000 acres, two three-kilometer runways and a third only slightly shorter, and all the services of supply, repair, and communication of a first-class airport. In 1951 the arrivals and departures of planes there averaged about twenty daily and of passengers nearly 440, as may be calculated from Table 7.

Table 7 - Traffic of Egyptian Airports, 1951

Airport	Arrivals		Departures	
	Planes	Passengers	Planes	Passengers
Cairo International	7,593	154,561	7,584	163,434
Almaza	3,875	31,182	3,874	43,452
Alexandria	2,230	22,993	2,227	21,590
Luxor	525	5,562	525	5,430
Port Sa'id	456	4,132	455	3,737
Others	4,856	3,345	4,858	3,411
Total	19,935	221,778	19,523	241,540

INTERNAL AIR TRANSPORT

Although cloudless skies and invariably settled weather conditions make Egypt an ideal flying country, the distances between the major cities are so short and railroad passenger service is generally so good, that it was long felt that there would never be enough use of internal air transportation to make it pay. Only for the long trips between the delta and the towns of the upper valley did there appear to be any possibility that flying would save any appreciable amount of time. However, in 1932, the Misr organization, always Egypt's most progressive and venturesome group of industrialists and financiers (see Chapter 9, Manufacturing), organized an air-navigation company, the Misr Airlines (or Misrair, as it is commonly called), in affiliation with the Bank Misr. In 1933 this company began to make scheduled flights. It was at first subsidized by the government, but by 1941 it was paying its own way. In 1951 Misrair planes flew 337,868 miles in the country and carried a total of 979,327 kilograms of freight and baggage, 73,516 kilograms of mail, and 41,176 passengers. Contrary to all expectations, by far the greater part of the mileage flown and of passengers and freight carried has been on its delta routes.

Egyptian International Service

Misrair has seven Vickers Viking Flying Pullmans, and in addition to the local services, for which it has more or less a monopoly, now operates on regular schedules throughout the Middle East as far east as Tehran, south to Khartoum, Port Sudan, and Addis Ababa, and to Istanbul, Athens, Naples, and Geneva.

In 1948 a second company, the Services Aeriens Internationales d'Egypte, commonly known as SAIDE, organized by a group of Italian and Egyptian financiers, began a schedule of regular Cairo-Europe flights, which included Athens, Rome, Munich, and Frankfurt, and later added scheduled flights between Cairo and Beirut and between Cairo and Tunis, Benghasi, and Tripoli.

Table 8 - International Operations of Egyptian Airlines, 1951

	Misrair	SAIDE
Flying hours	7,908	3,626
Mileage flown	1,329,388	608,669
Passenger miles	15,824,000	7,581,106
Freight and baggage tonnage	2,384,390	1,013,294

Besides the Cairo International and the Almaza airports, Egypt now has nine other airports or fields, which are used mainly in connection with internal flights. Of these the Embabeh port at Cairo and ports at Alexandria, Port Sa'id, and Luxor are the best equipped. The five others (at Minya, Asyut, Qena, Aswan, and Wadi Halfa) are landing fields with only a minimum of services. The present government has taken possession of all of the country's airports and fields.

SEA TRANSPORT

Steamships flying the Egyptian flag are now in service between Egypt and European, Turkish, Saudi Arabian, and American ports, but of the imports landed at Egypt's ports and exports shipped from them - averaging around 4,000,000 tons and 3,000,000, respectively, since World War II - they carry somewhat less than two per cent. At the outbreak of the war the total tonnage of Egypt's three shipping companies (the Misr Navigation Company, the Alexandria Navigation Company, and the Khedivial Mail Line) was a little less than 110,000, and this had been made possible largely by an annual government subsidy of £E 100,000 ($287,000). Nearly half of this tonnage

was sunk during the war, but postwar purchases have restored the combined fleet to close to its prewar tonnage.

Following the war a number of projects for modernizing the ports of Alexandria and Suez were presented to the Egyptian government by the Ports and Lighthouses Administration. For Alexandria these included the construction of a quay to accommodate larger liners which must now unload and load at anchor; the building of a large drydock to replace the small and now little-used dock built in 1901; the provision of modern grain-handling and storage facilities much needed for heavy imports of wheat and other bread grains (1, 071, 864 metric tons in 1951); and a large-scale program of harbor dredging and general quay improvement. Extensive projects were also proposed for the improvement of port facilities at Suez.

Little had been accomplished on these projects up to the overthrow of the government in 1952, except for some dredging and dock repair at both Alexandria and Suez. Plans of the present government call for the speedy completion of all these projects, with priority given to the construction of the drydock at Alexandria. In addition it is proposed to create a loan fund for increasing the present fleet of sea-going vessels and to set up regulations to give Egyptian ships priority with respect to export shipments.

There is some trade carried on coastwise and with some of the eastern Mediterranean ports by sailing vessels. Of a total of 182 arrivals and 175 departures of sailing vessels at Egyptian ports reported for 1947 (statistics for subsequent years are not available), 95 and 84, respectively, were by Egyptian vessels, and they carried 46, 030 tons of the 114, 280 tons of freight landed and cleared by sailing vessels from Egyptian ports.

Ports

Although Egypt has a coastline on the Mediterranean and Red Seas of nearly 1000 miles (1600 kms.), it has only three ports of any real significance - Alexandria, Port Sa'id, and Suez - and of these the port of Alexandria handles all but an insignificant portion of the country's foreign trade. The reported arrivals and departures at the other two are for the most part only brief stops for fuel and other supplies by ships passing through the Suez Canal. None of the small coastal ports has much more than local importance. Some were of considerable consequence in the remote past, but all have stagnated with the rise of Alexandria and the development of railroad, road, and canal connections.

Along the Mediterranean coast west of Alexandria, such towns as Salum and Mersa Matruh have as hinterlands only narrow coastal strips, where agriculture is dependent on sparse and undependable rainfall. The same is true for the Red Sea ports, with the added disadvantage that numerous coral reefs make most of them difficult of access. Some of the Red Sea ports do serve as outlets for the products of mining activities in the Red Sea Mountains and Sinai and the oil fields of the Red Sea coast. All of them have some local coastwise traffic, and some are bases for the operations of small fishing fleets. But none of them is otherwise of any importance, since

their only direct connection with the population centers of the Nile valley and Nile shipping is by many miles of desert road.

Of the delta ports, Rosetta and Damietta might appear to offer good possibilities as ports, since each is near the mouth of one of the Nile's two delta branches. However, the lower reaches of the Nile branches are heavily silted by the annual floods and prevailing northerly winds pile up frequently shifting bars across their mouths, making navigation hazardous even for small boats.

Alexandria.

On Egypt's long coastline only the harbor of Alexandria has the natural features suitable for the development of a great seaport. Although it is located at the edge of the Nile delta, it is far enough from the most westerly of the delta branches of the river to be out of reach of most of the floodwater silt that makes Rosetta and Damietta inaccessible to any but small craft. This fact, as well as the protection from Mediterranean storms afforded by Pharos Island on the north and the promontory on the east known then as Lochias, doubtless attracted Alexander the Great to found a port there.

Alexander had two motives in surveying the delta coast for a port. He wanted a naval base for his operations against the Persians and he wanted a better entrepôt between Macedonia and the agricultural riches of the Nile delta and valley than the old Greek port of Naukratis afforded. Naukratis, a port and trading center established by the Pharaoh Amasis (568-525 B.C.) for the exclusive use of Greek merchants, was located about ten miles west of the present town of Rosetta, a short distance above the mouth of a branch of the Nile called Canobic by the Greeks, which was then the westernmost delta branch. Strabo reports that Naukratis was never a good port, because of shallows and marshes at its mouth,[9] and the entire Canobic branch has been completely silted up for centuries.

When Alexander began building his port the only settlement on the harbor was an Egyptian fishing hamlet, called Rhacotis by the Greeks, where, according to Strabo,[10] the Egyptian kings maintained a guard to prevent the landing of any foreigners there. Alexander died in Babylon during the year following the founding of his port, but his successors, the Ptolemies, proceeded at once to carry out his plans. Rhacotis was already connected by canal with the Canobic branch of the Nile, which the early Ptolemies widened and deepened to provide a navigable waterway from the new port through the delta and on into the Nile valley. But the growth of Alexandria to a great port and commercial center was due primarily to its rapid development as the chief transit point for trade between the Mediterranean world and the East, rather than to its use as a port of export for Egypt's agricultural products, as it was to become during the period of Roman rule, or as a port of import of foreign merchandise for Egyptian consumers.

The preëminence of the port in East-West trade continued long after Alexandria had lost its glory as a cultural center. Even during the last third of the Ptolemaic period (the Ptolemies ruled Egypt from 333 to 30 B. C.),

when the weakness of the later dynasties and their family dissensions brought cultural and economic depression to the rest of Egypt, Alexandria continued to thrive. Although there was some decline during the early years of the Roman occupation, Rome's growing interest in East-West trade and its development of Egypt as one of its most important sources of food supplies soon restored to the port a large measure of its old activity and prosperity to the city. Before the end of the reign of Augustus (14 A.D.), the population of Alexandria is believed to have been well up toward half a million.

With the decline of the Roman Empire, Alexandria also declined. Although it was the seat of government of the prefecture that Rome had made of Egypt, it was to Egyptians an alien city. Its main role was as a center from which orders came as to what crops the Egyptian farmer should grow and as the port through which his products were carried off to Rome.

During the Byzantine period (about 300 to 639 A.D.), the city was for a time the acknowledged center of the Christian world. But strife between church parties, persecution of the Christians by the non-Christians, and finally the expulsion, early in the fifth century, of the Jewish population that had for centuries contributed vitally to the prosperity of the city as merchants and entrepreneurs, combined to smother practically all commercial and industrial activity. Alexandria was still the most important of the Mediterranean entrepôts of East-West trade. But during this period and the succeeding period of Arab rule (639-868 A.D.), this trade was of little consequence. During the Medieval era (868-1517 A.D.), when Egyptian sovereignty at times included most of North Africa and the islands of Sardinia, Sicily, and Malta and extended as far east as the Euphrates, Alexandria regained some of its former importance as a naval base and transit port and as a focus of trade with the Nile delta and valley. But the founding of Cairo, in 969 A.D., robbed Alexandria of most of its local trade, and the discovery of the Cape of Good Hope route in 1498 reduced it to insignificance in the trade between Europe and the East. The Turks, who conquered Egypt in 1517, viewed the port of Alexandria as a rival to Constantinople and ignored it so effectively that by the end of the eighteenth century the population of the city was no more than four or five thousand. Meanwhile, the silting up of the Canobic Branch of the Nile had not only left the port without a waterway connection with the Nile valley but without even a direct supply of fresh water. Alexandria's rebirth in the nineteenth century is to be credited, in the first instance, to Mohammed Ali's need for a naval port and arsenal for the campaigns with which he planned to build an empire. But he also envisaged it as a port for the export of the surplus of farm products, which he expected the country to yield as he expanded the area under irrigation and introduced new crops (see Chapter 4, Agriculture), and for the import of the machinery and raw materials for the industries he planned to develop. What is now called the Eastern Harbor was the Great Harbor of the Ptolemaic and Roman periods. (The Western Harbor was little used until later.) Entrance into Great Harbor required careful navigation, owing to a chain of rocks, some submerged and others rising above the water, between the Lochias promontory and Pharos Island. For this reason the famous Pharos lighthouse was built by the Ptolemies on the eastern tip of Pharos and a long breakwater was later extended out toward Pharos from the end of the promontory. A great

mole nearly a mile long and pierced by two bridged shipways, also built early in the Ptolemaic period, connected Pharos with the mainland and guarded Great Harbor on the west. (The Pharos lighthouse, which is believed to have been 400 feet or more in height, was one of the ancient Seven Wonders of the World. It is the prototype of lighthouses the world over, and its name, in various forms, is the word for lighthouse in all the languages of southern Europe: Italian and Spanish, faro; Portuguese, farol; French, phare.)

The eastern end of Pharos and the lighthouse have long been washed away, but the lighthouse had previously been permitted to fall into ruins. The great mole still connects Pharos with the mainland, but it is buried beneath centuries of accumulations of debris and wave-washed sand and silt to a width of nearly a mile at its narrowest part, and it is now the site of a large section of the modern city of Alexandria. Eastern Harbor is a far poorer harbor now than it was in the days of the Ptolemies. Open to the sea and too shallow except for boats of small draft, it is used only by fishing boats. The only recent improvement is a breakwater built in 1916 to protect the wharves at which the fishermen unload their catch.

Western Harbor, first improved by Mohammed Ali, is protected by two breakwaters. One, about two miles long, completed in 1873 and lengthened in 1907, connects with the Ras et-Tin promontory at the west end of what is left of Pharos. The other is a short breakwater built out from the mainland. The half-mile opening between these breakwaters is a rocky passage with only four passes through it. Two of these are fairways deep enough for large ships, but only one of them, known as Great Pass, with a depth of 35 feet and a width of 200 yards, is safe for night navigation.

The total water area enclosed by the Western Harbor breakwaters is 1863 acres - the largest of any Mediterranean port. It is divided into an Outer Harbor of 1398 acres and an Inner Harbor of 465 acres by a long mole for unloading coal, built out from the mainland, and a short breakwater connected with the Ras et-Tin promontory. In the Outer Harbor, where depths range from 31 to 65 feet, are the Coal Basin and specially equipped wharves for loading and unloading different types of merchandise and freight - all of them with rail connections. In the Inner Harbor, where depths range between 25 and 39 feet, are the wharf for large ocean liners, with three quays and a total of 17 berths, the Coast Guard Station, and such other government buildings as the Customs House, Port Police Station, and Passport Office.

Western Harbor has an annual port capacity of somewhat over 6,000,000 tons, as compared to only 2,000,000 in 1890, but its wharves and wharf facilities are inadequate for the rapid loading and unloading of the cargo it handles. Considerable progress has been made in lengthening wharves and deepening berths since World War II, however, and a new petroleum wharf and drydock are being built.

The value of cargoes shipped out of Alexandria in 1951 was 91.2 per cent of the total of Egypt's exports. They accounted, however, for only 37.8 per cent of the total export tonnage, because of the export of heavy products of relatively low ton value, mainly manganese and phosphates, shipped from the Red

Sea ports near the sources of production. Cotton and cotton goods, high in ton value and representing nearly 85 per cent of the total value of Egypt's exports, are shipped for the most part from Alexandria. Some small amounts from cotton plantings on the west side of the delta are exported by way of Port Sa'id.

Alexandria still does a considerable business in its old role as a transit port; in 1951, 230,829 metric tons of transit goods entered the port, and 226,650 were shipped out. This almost equalled transit shipping at Suez (225,982 and 251,750 tons, respectively) but was only a little more than a fifth of Port Sa'id's 969,268 and 954,139 tons.

Port Sa'id.

Unlike Alexandria, Port Sa'id has no history of ancient grandeur. But today it is the country's third city in size (population, according to the 1947 census, 177,703) and second in importance of its ports. Its site is a narrow strip of low, swampy land between the Mediterranean and Lake Manzala which was enlarged by draining part of the lake and raised with earth dredged out in excavating its inner harbor. It was named for Mohammed Sa'id, Governor-General of Egypt from 1854 to 1863, and a strong supporter of the canal project.

Near the present site of Port Sa'id, an ancient Mediterranean port called Pelusium was connected with the Nile by what is known as the Pelusiac Branch of the river, a waterway long completely silted up. During the early years of Roman rule Pelusium developed into a great entrepôt for East-West trade. The land route to it from the Red Sea was much shorter than any overland or land and canal route to Alexandria. But, with only an open roadstead on the Bay of Pelusium, it could not long compete with Alexandria's more protected harbor and port facilities. Alexandria became the only logical outlet for the granary that Rome was making of Egypt, and before the end of the Roman period Pelusium was deserted and in ruins. All that remains of it today is two mounds about 22 miles southeast of Port Sa'id. Plans for the present Suez Canal called for a port at its Mediterranean entrance, and construction of Port Sa'id was carried on concurrently with that of the canal. Harbor dredging and land reclamation began in 1862, and by 1869, when the canal was officially opened, Port Sa'id was already a port of considerable importance.

The harbor, entirely man-made, is formed by two concrete breakwaters extending into Lake Manzala, adjacent to the canal, and is connected with the Mediterranean by a 3.3-mile straight channel. Rapid silting necessitates constant dredging of both harbor and channel. In fact, so continuous is the silting and so necessary is first-hand knowledge of the location of its constantly shifting deposits for safe navigation that all vessels of over 300 gross tonnage are required to take on pilots for the channels and harbor. There are a number of basins with depths ranging from 18 to 38 feet, several of which are specially equipped for unloading and storing fuel coal and petroleum and for fueling ships in transit. One basin (Cherif) is designed for handling imports and exports and storing transit goods, with warehouses and with rail lines connecting with the Cairo-Ismailiya-Port Sa'id branch of the Egyptian

State Railways. Only these basins are kept dredged. Elsewhere the depths vary greatly and are generally sufficient only for boats of small draft. Even in the dredged basins there are no wharves long enough to accommodate large ships alongside, so that most loading and unloading has to be done by barges. Coaling of steamers and provisioning are also done by barges. Oil fuel is supplied by both pipe line and barges.

Although Port Sa'id's primary purpose is to service ships in transit through the Suez Canal, since the standard gauge railroad connection with Cairo was completed in 1904, it has also become significant as a port of import and export. In recent years Port Sa'id's imports have averaged about 9.6 per cent of Egypt's total, and its exports 5.4 per cent, which ranks it second to Alexandria - but a far-distant second. Cotton from the northeastern part of the delta brought by boat across Lake Manzala from Matariya accounts for most of its exports. Imports consist mainly of products, notably tobacco, brought by small vessels from the nearby countries of southeast Asia. Rarely, if ever, is Port Sa'id the destination of cargo ships from western Europe or the United States, since Alexandria is so much nearer and so much better equipped for berthing and unloading. Port Sa'id is, however, Egypt's principal transit port, with 969,268 metric tons of transit goods entered in 1951 (the most recent year for which the statistics have been published) and 954,139 shipped out.

The phenomenal population growth of Port Sa'id is difficult to explain even in densely crowded Egypt. It has no hinterland, unless the northeastern part of the delta can be so considered, and that is accessible only by boat across Lake Manzala. When rail connection with Cairo was completed in 1904, Port Sa'id had a population of no more than 50,000, largely foreign. The population is now ninety per cent Egyptian. High wages paid by the canal company, opportunities for services that a transit port must offer, and the possibilities of a lucrative tourist trade attracted Egyptians to the port once the railroad was put through. The numerous public services fostered and supported by the Suez Canal Company have been an added attraction.

Port Sa'id has no large manufacturing establishments. The 1947 census reported a highly diversified manufacturing industry, but the total number of persons giving manufacturing as their occupation was only 11,448, and the great majority of these worked at home or in small handicraft shops. Fishing is the largest single productive industry (8117 fishermen). Transportation - 13,834, more than half of them engaged in various port activities - furnishes employment for many more persons than manufacturing. Public services accounted for a total of 9065 - 3910 in the Egyptian army, 4026 in the Coast and Frontier Guards, and 1129 policemen and firemen. Of the 12,137 persons working in retail stores, a very large number are operators of small handicraft outlets whose business depends almost exclusively on the ships and on occasional tourists on their way to Cairo.

Port Fouad, on the east side of the canal opposite Port Sa'id, dates only from 1911. It was built by the Suez Canal Company as a more pleasant and healthful place of residence for employees of the company than Port Sa'id.

Until the seizure of the Canal by the Egyptian government, Port Fouad (population 4000), was administered entirely by the company, whereas Port Sa'id was governed by a government commission.

Suez.

When the construction of the Suez Canal began, Suez was only a primitive village of a few thousand inhabitants with no harbor facilities of any sort, although settlements in the vicinity had been of considerable importance as transit ports in the remote past. A port called Clysma by the Greeks, a little north of present-day Suez, probably served as a transit point for shifting Red Sea cargoes to canal boats, during the low-water season of the Nile, when the water level in the canal was too low to carry any but shallow draft vessels. Arsinoë, the port built for the same purpose by Ptolemy II (see Chapter 11, The Suez Canal) is believed to have been on the opposite side of the canal entrance from Clysma.

The present Suez consists of three towns: Suez on and near the site of the old village and not actually on the Suez Canal but connected with it by a shallow tidal creek; and the port suburbs of Port Taufik and Port Ibrahim. They form a single city for administrative purposes, with a population of 107,244 in 1947. Rail lines connect the city proper with its ports, and it has direct rail and road connection with Port Sa'id and the intervening canal towns and villages and with Cairo, and a fairly direct double-track connection with Alexandria by way of Ismailiya, Zaqaziq, Benha, and Tanta.

Port Ibrahim and Port Taufik are back to back, the former facing on the harbor, the latter a stretch of about a mile along the canal. The harbor is divided into two sections, known as Old Harbor (divided into North and South Basins by a mole about 600 yards long) and New Port. Ships stopping regularly at Suez have permanent berthing facilities in the basins, whose depths vary between 21 and 30 feet. A drydock, 410 feet long by 100 feet wide and nearly 36 feet deep, is located at the northeast end of South Basin. At the west end of New Port is the Petroleum Basin, with four concrete jetties, and a Petroleum Breakwater, with two such jetties. This section of the harbor also has a special jetty where cattle boats unload.

Suez is relatively unimportant in Suez Canal navigation. Most ships in transit stop only long enough to take on or put off a pilot. Although supplies of oil and water are available and repairs can be made, the facilities are better at Port Sa'id.

The main importance of Suez is as a port of entry for petroleum from Egypt's Red Sea coast and for such additional imports as are required to make up the difference between local production and the country's consumption requirements. The imports entering Suez average about one per cent by weight and 5.3 per cent by value of Egypt's total. These import figures, however, include the crude petroleum from the country's own wells.

Industrial activity in Suez is mainly connected with Egypt's two oil refineries, one privately owned and one government owned, with a combined annual capacity of 3,300,000 tons. Until the United States army put a pipe

line through to Cairo during World War II, all oil from the refineries to the consuming centers of the Nile delta and valley was transported by rail and motor truck tank. The pipeline, owned by the government and under lease to the Anglo-Egyptian Oilfields, Inc., the owner of the larger of the two Suez refineries, now carries a large part of the oil, but substantial amounts must still be carried in rail and truck tanks, and the government has contracted for the laying of another pipeline.

Ismailiya.

Ismailiya (population 68,229 in 1947), on the west bank of Lake Timsah midway of the canal, has no port functions except that it supplies fresh water. The pilots who come aboard at Port Sa'id and Suez change ships at Ismailiya to return to their base ports, and this is usually done without stopping the ships.

Founded by De Lesseps in 1863 as his principal base of operations, Ismailiya was the management headquarters of the Suez Canal Company. It is almost entirely a product of the company, and was administered by the company, with the Egyptian government supplying only the police force. It has good schools, cooperative stores, a bathing beach, and a hospital which serves all of the Canal Zone. There are small confectionery and electric lightbulbs manufacturing establishments, but Ismailiya is mainly a residential town with many fine houses and beautiful gardens.

Damietta.

Of Egypt's minor Mediterranean ports, the delta ports of Damietta and Rosetta are the only ones of any consequence. Damietta (population 53,631 in 1947), on the branch of the Nile of the same name about eight miles above its mouth, is by far the more important of the two. After the Canobic Branch of the Nile had become so silt filled as to be unnavigable, Damietta was for some time a rival of Alexandria in the export of agricultural products from the Nile valley and delta. But the silting of the lower reaches of the Damietta Branch and sand bars at its mouth made the port always difficult of access, and with the restoration of waterway traffic between the Nile and Alexandria by the opening of the Mahmudiya Canal in 1820, Damietta rapidly declined. The advent of the steamboat gave it its final blow.

Since the early years of the nineteenth century a rich cotton- and rice-growing hinterland has developed around Damietta, for which it might well be the port of export if large vessels could enter the branch. Moreover, from April to August the branch is completely blocked by an earth dam constructed each year a short distance above its mouth. Built anew each year, this dam keeps the water level sufficiently high to feed the irrigation canals that take off from it and also to prevent the entry of sea water (see Chapter 5, Irrigation).

Nevertheless, sailing vessels still carry locally-manufactured cotton fabrics, leather goods, and rice from Damietta to eastern Mediterranean ports. There are good rail and road connections with Cairo and less directly with Alexandria, and steamer connections with Port Sa'id across Lake Manzala.

Rosetta.

Rosetta (population 28,558 in 1947), on the Rosetta Branch of the Nile about eight miles above its mouth, was also a port of considerable importance before the opening of the Mahmudiya Canal. It might still be, since it is the commercial center of a rich cotton and rice section of the delta, if it were not that the mouth of the Rosetta Branch is as difficult to navigate as that of the Damietta Branch, and for the same reason. Also, like the Damietta Branch, its mouth is closed from April to August, by an earth dam until 1951, since then by a masonry barrage at Edfina. Rosetta participates to some extent in the same sort of foreign trade as Damietta, but very much exceeds it in coastwise trade, of which the most important item is rice for Alexandria and Damietta.

Ras Gharib.

All of Egypt's Red Sea ports owe their present activity exclusively to the exploitation of nearby mineral deposits. The most important in value of shipments is the petroleum port of Ras Gharib, which ships oil entirely to the Suez refineries. Ghardaqa (Hurghada) was the original Red Sea oil port but, with the decline of the oil fields it served and the tapping, in 1938, of a new field from which Ras Gharib is more easily accessible, most of the port equipment was moved there (see Chapter 8, Raw Materials and Mining). In 1948 Ghardaqa shipped only 16,000 tons of crude oil as compared to 1,335,000 tons shipped from Ras Gharib.

Quseir.

Next in importance to Ras Gharib in value of outgoing shipment is Quseir (Kosseir), the port for the nearby phosphate mines that an Italian company, the Societa Egiziana per l'Estrazione ed el Commercio del Fosfati, has been exploiting since 1912. Quseir is an old port. It is believed to have been founded in Pharaonic times as a transit point from which ship cargoes from the Sudan and Somalian coast were carried by caravan to the Nile valley. In the Ptolemaic period it was again connected with the valley by desert road. There is now a road to it from Luxor. Tar-surfaced during World War II, this road is no longer kept in repair, but is still passable for motor vehicles. A railroad was also built during the war to connect Quseir with Qena on the valley railroad, but it was little used and has been abandoned.

Quseir has no real harbor. Although the anchorage is partly protected, reefs which fringe most of the coast make the approach to it dangerous. The loading pier is equipped with a chute connected with the phosphate plants by aerial cableway. Between 200,000 and 300,000 tons of phosphate are shipped out annually, mostly to Spain, Italy, Greece, and Australia. Imports are insignificant and consist entirely of supplies for the mine and the port village.

Safaga.

Safaga, the next port north of Quseir, is also a phosphate port serving one company, the Egyptian Phosphate Company. It owes its existence entirely to the exploitation of phosphate beds discovered in 1909-1910 in the nearby Wadi Safaga. Shipments of phosphate from it are small as compared with those from Quseir; only 63,000 tons were exported in 1948. The harbor is much superior to that at Quseir. The phosphate pier has a depth of 30 feet

and is connected with the mines by a sixteen-mile, narrow gauge railroad. A motor road, so-called, but consisting only of a desert road tarred during World War II, connects the port with the valley city of Qena. A deep-water wharf and another wharf for unloading tankers were built by the Allied forces to provide means for getting in oil and other supplies in case shipping to Suez was blocked, but they were never used for that purpose.

Abu Zenima.

Abu Zenima, on the east (Sinai) shore of the Gulf of Suez about 65 miles from Suez, is the port and headquarters of the Sinai Mining Company, which operates the manganese mines at Um Bogma, on the west side of the Sinai peninsula. Its population of about 150 consists entirely of employees of the company and persons catering to them. The harbor is the best of any of Egypt's Red Sea or Gulf of Suez ports. The anchorage is fairly well protected, and the loading pier has depths up to forty feet at its head. Connection with the mines is by a nine-mile, narrow-gauge railroad and a six-mile aerial cableway.

COMMUNICATIONS

The Postal Service

The total of 6575 post offices reported in the official statistics for 1951 might be thought a rather large number for a people with so high a rate of illiteracy. (Somewhat surprising, too, is the considerable use of parcel post; of 209,221,000 pieces of mail handled by the post offices in 1951, 1,084,000 were parcel post packages, as shown in Table 9.) However, of the post offices listed, 5259 were rural stations, usually in the houses of minor officials, where mail is collected and deposited by the rural postmen, who carry it afoot or on donkey back from hamlet to hamlet. Another 470 were at railroad stations. Many of the rural and railroad station post offices have no official attendants in charge, and many rural carriers must serve more than one collecting station, since only 2047 persons were listed

Table 9 - Mail Handled by the Egyptian Postal Service (in thousands)

	Domestic		Foreign		Total	
	Letters	Parcels	Letters	Parcels	Letters	Parcels
1948	144,434	1,044	37,262	123	181,696	1,167
1949	147,405	1,009	45,842	150	193,247	1,159
1950	150,978	954	49,485	175	200,463	1,129
1951	144,583	905	52,534	179	208,137	1,084

in the census as mail carriers. Most of the country's postal activity is confined to the urban centers; of the 5644 persons engaged in the postal service in 1947, 1805 were employed in Cairo and Alexandria.

As is the case with most government enterprises in Egypt, the postal system operates at a substantial profit; in 1951 operational expenses amounted to £E 872,667 ($2,404,554), while receipts totalled £E 1,120,653 ($3,216,274).

Telephone Service

Telephone communication has been exclusively a government service since 1918, when the system was purchased by the government from a private company. Although there has been considerable expansion of the service in recent years, as shown in Table 10, in 1952 there was only about one telephone to every 165 inhabitants. Most of the telephones are in government and business offices. Telephones in residences are still a luxury, and public telephones, to be found mainly in post and telegraph offices, account for less than 1 per cent of the total. In the rural areas telephone communication is strictly for official use; as a rule, each of the principal villages has a single instrument which connects it with the district seat of government, the provincial capital, and government offices in Cairo. Government revenue from private telephones and telephones available to the public averaged £E 1,664,780 a year for the five-year period 1947-1951, or about £E 15 ($43) per instrument.

Table 10 - Telephones in Egypt

Year	Private	Government	Total
1947-1948	79,603	19,375	98,978
1948-1949	83,662	20,218	103,880
1949-1950	90,154	20,941	111,095
1950-1951	100,016	21,530	121,546
1951-1952	106,521	21,625	128,146

Cairo and Alexandria have two-thirds of all the telephones - 45 per cent and 22 per cent, respectively. The exchanges in these cities are all automatic, as are most of those in Port Sa'id and Mansura. Similar exchanges were being installed or were on order in most of the other major cities of the delta and Canal Zone at the time of the coup d'état in 1952.

In spite of the high cost of telephone service, the demand is so heavy in all parts of the country, and especially in the delta, that before the revolution the Telephone Administration had set up a development program which called for the installation of 10, 000 new subscriber lines a year. (In Cairo alone the waiting list in 1951 was estimated at 20, 000).[11] Convinced that revenues from the existing system will cover the cost of the new lines, the present government has proposed still more extensive installations.

The Telegraph System

Most of the telegraph system was government owned even before the 1952 revolution. A British company, the Eastern Telegraph Company, had 260 miles of lines - an Alexandria-Suez line by way of Cairo and a Suez-Port Sa'id line - which connected with its cables to Europe and the East. In 1951 the government system had 728 offices, mostly in post offices and railway stations, and 5689 miles of line. Telegraph service is available in most places reached by railroad. Consequently, telegraphing is a more general means of communication over the country as a whole than is telephoning. The government's telegraph offices handled 9, 248, 000 telegrams in the fiscal year 1951-1952, of which two-thirds were received or sent by government offices. Arabic is the language most commonly transmitted, but operators at the principal city offices send and receive in the Latin alphabet also.

Wireless Telegraph and Radio

Until 1956 wireless telegraph service was shared by the government and the Marconi Wireless Telegraph Company. The government maintained two stations in Alexandria and one each in Cairo (at the Almaza Airport), Port Sa'id, Mersa Matruh, Salum, Dakhla, Luxor, and Quseir (on the Red Sea), but government operations were extremely limited, consisting mostly of local transmission of communications from overseas and messages having to do with local aircraft operations. The great bulk of the sending and receiving of overseas communications for the government, as well as for the press and the public, was handled by the Marconi Company. This company has now been taken over by the government.

Radio broadcasting has been a government monopoly since 1947, when the government took over the station at Abu Za'bal, about twenty miles north of Cairo. This station was opened in 1934 by the Marconi Wireless Telegraph Company. Its transmission range was subsequently greatly increased, and additional stations were set up in Alexandria, El Minya, and Asyut, so that local broadcasts can now be heard not only throughout Egypt but in most of the Arabic-speaking countries.

Theoretically, all receiving sets are licensed and annual license fees are charged on both sets and tubes - £E 1.30 ($2.93) and 5 piasters (about 14 cents), respectively, in 1954. The total number of licensed sets in the country in 1954 was 305, 000 as compared to 109, 000 in 1945. Even so, this amounts to only about one set to every 72 inhabitants. Unregistered sets, however, are said to number in the thousands, many of them crystal sets constructed from surplus stock left by the Allied forces after World War II.[12]

Radio reception, nevertheless, is still generally available only in the cities and towns. It is mostly out of reach of the rural population, except in the larger villages. Here electric radio sets, in the few villages that have electricity, and battery-powered sets elsewhere, are coming more and more to be regular items of equipment in the cafés that serve as the centers of social life for the men. At public gatherings, also, radio sets are rarely missing.

Egyptian music, readings from Arabic literature, local news, and foreign news items of interest to Egyptians and the other Arabic-speaking peoples are regular features of the programs broadcast from the Egyptian stations. Readings from the Koran, religious lectures, and lectures on Islamic law and ways of life are broadcast daily from all the stations. Broadcasting is mainly in classical Arabic, but broadcasts in colloquial Arabic on subjects of special interest to the rural population have been introduced recently. They include lectures on farming methods, use of fertilizers, care of livestock, sanitation, child care, and the like. There is also some broadcasting of English, French, Greek, and Italian programs, especially by the Cairo and Alexandria stations. The broadcasts designed for listeners in the other Arabic-speaking countries were in the past chiefly religious, but news of the Arab world and foreign news of special interest to it are now prominent features of the daily broadcasts.

Newspapers

Egypt has the most highly-developed press of any of the Arabic-speaking countries. According to the latest authoritative report,[13] 55 newspapers were published daily, of which 26 were in Arabic and about half that number in French. The remainder were in various foreign languages, and their circulation was chiefly in the corresponding foreign colonies, although the English dailies have, or had until recently, a considerable circulation among educated Egyptians. More than half of these dailies were published in Cairo and 20 of them in Alexandria. (Many of the foreign newspapers have now been suppressed. No reports are available on the number now being printed.) There are also many weekly and fortnightly newspapers and periodical publications - mostly popular illustrated magazines; and a wide variety of technical publications, including journals of local scientific and other learned societies, many of which have in the past appeared in English or French, with or without corresponding text in Arabic.

The most widely circulated Arabic dailies are Al Alram (The Pyramids) and Al Gumhouria (The Republic), both published in Cairo. A number of the other larger cities and towns have their own daily newspapers, but their distribution is almost entirely local.

Circulation of all these publications is small. In 1952 the number of daily newspapers distributed amounted to only about 25 copies per thousand persons of the total population as compared to 615 in the United Kingdom and 353 in the United States.[14] Newsprint consumption per capita in 1951 was only about two pounds as compared to 77 pounds in the

United States and 26 in the United Kingdom. The great mass of the people, particularly the country folk, rarely see a newspaper and, at their present level of literacy, have little comprehension of its contents when they do.

NOTES

1. As of 1953, there were 3499 miles (5685 kms.) of freight and passenger routes, 10,812 miles (17,407 kms.) of roads classed as passable for wheeled vehicles, and 2074 miles (3342 kms.) of navigable waterways (962 miles of the Nile River and 1112 miles of irrigation and drainage canals).

2. The Egyptian Revolution in Three Years, Information Administration, Cairo, 1955.

3. The Egyptian Delta Light Railways, Ltd., was originally a British company operating under a concession granted in 1896. In recent years control passed to the Egyptian shareholders in the company; in 1952 the government put its lines under sequestration and in 1955 took possession of them.

4. It is probable that these lines have now been taken over by the government, but information on them is not available.

5. Great Britain and the East, December, 1947, p. ME 35.

6. Egypt, Overseas Economic Surveys, October, 1951.

7. From Egyptian Roads, The Egyptian Economic and Political Review, Vol. 1, No. 6, February, 1955, pp. 27-30.

8. Anwar Bakir: Contribution à l'étude du probleme de la coordination des transportes en Égypte, L'Égypte Contemporaine, July, 1951.

9. The Geography of Strabo, translated by H. C. Hamilton and W. Falconer, London, 1857, Vol. 3, p. 239.

10. *Ibid.*, p. 227.

11. A. N. Cumberbatch: Economic and Commercial Conditions in Egypt, Overseas Economic Surveys, Board of Trade, London, 1952, p. 85.

12. Charles Issawi: Egypt at Mid-Century, An Economic Survey, London and New York, 1954, pp. 188-189.

13. *Ibid.*, pp. 190-191.

14. Statistical Yearbook, 1953, Department of Economic Affairs, Statistical Office, United Nations, 1953, pp. 541-542.

11. THE SUEZ CANAL

The Suez Canal, which connects the Mediterranean with the Red Sea, has been in existence for almost a century. Since its completion in 1869 the canal has provided the most convenient and rapid water route between Europe and southern Asia. The Suez Canal is by far the most important part of Egypt to the Western world, and has had a tremendous impact upon the history of modern Egypt. But it is located far from Egypt's main population centers, and it was conceived, built, and until 1956, operated by foreigners. When Ferdinand de Lesseps went to Egypt in 1854 to present his scheme for the construction of a canal through the Isthmus of Suez, the idea was by no means a new one. Ptolemy II conceived of such a project, but abandoned it when he was warned that the Red Sea was so much higher than the Mediterranean that a canal would flood Lower Egypt. This erroneous idea was generally accepted for almost two thousand years. Not until 1847 was the difference in sea level shown to be negligible.

Early Nile-Red Sea Canals

After Ptolemy gave up his plan for an isthmian canal, he turned his attention to the ancient canals which had once connected the Red Sea with the Nile. These canals were designed primarily to bring gold, ivory, ebony, myrrh, and wild animals and skins from the coast of Sudan and Somalia and the Arabian peninsula to the Nile valley, and to provide a navigable waterway between the Red Sea and the Egyptian interior not for trade between the Mediterranean and the East. The Persian conquerors of Egypt (525 B.C.) found the unnavigable remains of the so-called "Canal of the Pharaohs," which probably dated from the Twelfth Dynasty (about 2000-1782 B.C.). The canal issued from the old Pelusiac Branch of the Nile north of the ancient city of Bubastis (near the present site of Zaqaziq), followed the valley now known as the Wadi Tumilat to Lake Timsah (now cut by the Suez Canal), and then turned south and continued on to the head of the Gulf of Suez by way of the Bitter Lakes. Restored and enlarged by Darius (521 B.C.), who later destroyed part of it again, this canal was re-excavated by Xerxes. Transit on it from the Nile to the Red Sea took four days.[1]

Reconditioned again by the Ptolemies, the Canal of the Pharaohs was given a partly new course, terminating at Arsinoë near present-day Suez. Strabo reports that "the Ptolemaic kings ... placed locks upon the canal, so that they sailed, when they pleased, without obstruction, into the outer seas, and back again," and implies that the locks were installed because of the "erroneous opinion that the Red Sea was higher than Egypt."[2] The canal had to be restored once more by Trajan (96 A.D.), who abandoned the Pelusiac and connected the western terminus to the Nile at Babylon (near modern Cairo).[3]

Trajan's canal became unnavigable by the third century A.D., but the Arabs reopened it in 642 A.D. as the Canal of the Prince of the Faithful. Cargoes were brought into the Nile valley through this canal until

776 A.D., when it was closed to cut off supplies to Mecca and Medina, which were in revolt against the Caliphate. Since then there has been no canal connection between the Nile and the Red Sea. Until the Cairo-Suez railroad was opened in 1856, passage into or by way of Egypt from the Red Sea was by caravan. (The Ismailiya Canal, completed in 1862 to bring fresh water from the Nile to the Canal Zone, is navigable for small vessels but does not connect directly with the Gulf of Suez.)

Post-Medieval Interest in a Suez Canal

Throughout the Middle Ages, commerce between East and West by way of Egypt declined, while the overland routes to the north, developed by Marco Polo and others, carried an increasing amount of traffic until after the capture of Constantinople by the Turks. European efforts to find a new route to the East culminated in Vasco da Gama's voyage around the Cape of Good Hope to India in 1498, but while this route benefitted the Portuguese and the other Atlantic powers, the Mediterranean countries, which had previously monopolized trade with the East, found themselves cut off from their old sources of revenue. In 1504 Venice seriously discussed the idea of a Suez Canal, but Venice was too weak to support such a project. More than any other country, France needed a route that would make possible competition with the British and Dutch, who were going around Africa. And over the next three centuries the project of constructing a canal occupied the minds of many French statesmen and economists, notably that of Jacques Savary, whose The Complete Merchant (1675) set forth most clearly the advantages that would accrue to France from such a route.[4] The growth of English power in - and profits from - India, and the increase of Anglo-French rivalry throughout the eighteenth century led to still more ardent advocacy of a canal by the French. After losing most of her American empire, France felt that only a canal route would enable her to hold on, and perhaps expand, in Asia. Principally for this reason, England opposed a canal. The supreme importance of the question even in those days can be judged from Napoleon's comment in a letter to Talleyrand in 1793: "The time is not far distant when we shall feel that in order to destroy England it is necessary for us to possess Egypt." And in 1798, when he landed at Alexandria and seized the country, Napoleon's instructions were to "have the Isthmus of Suez cut through, and...to assure the free and exclusive possession of the Red Sea to the French Republic." As Talleyrand had said, when France became master of Suez "it will make little difference in whose hands the Cape of Good Hope happens to be"; the power of England in India, and consequently in Europe would be destroyed.

Napoleon took a keen personal interest in the canal project, but his engineers surveyed the route and reported against it, still believing that the Red Sea was more than thirty feet higher than the level of the Mediterranean. They recommended instead reopening the Canal of the Pharaohs between the Nile and Suez, but before this work could begin, the English destruction of the French fleet forced Napoleon to evacuate Egypt.

Just as French ambition required a canal at Suez, so English interests in the main opposed a canal. Not that they were against a canal as such - many English merchants were alive to the advantages of reducing transit time to India. But if a canal existed, any European power that seized it would be able to ruin England. In the first half of the nineteenth century, therefore, while various promoters continue to urge the construction of a canal, the English concentrated on improving the route they had begun to develop overland from Alexandria to Suez and thence by ship to India. The development of steam navigation at this time made the overland route all the more desirable, for the early steamers could not brave the high seas of the Atlantic on the Cape route, while on the other hand they could combat the prevailing north winds in the Gulf of Suez far more easily than could sailing vessels. The first steam voyage between Bombay and Suez took place in 1830, and regular transit service between Alexandria was available by 1834. While the Cape route from England to India still required about five months, the overland route with transshipment at Suez now took an average of only forty days.[6]

The development and monopolization of this overland route required a government in Egypt friendly to British interests. Still a Turkish province, Egypt was at this time under the administration of the vigorous and ambitious Mohammed Ali, whose efforts to gain independence from the Ottoman Empire had been thwarted once before by combined European action. Encouraged by France, in 1838 he made another effort to throw off Ottoman rule, but in the military maneuvers that followed the promised French aid failed to arrive, and British and Turkish forces made Mohammed Ali withdraw. However, in return for Mohammed Ali's submission the British persuaded the Sultan to make him hereditary Pasha of Egypt (1840). Thus England managed to maintain the Integrity of the Ottoman Empire (which was needed as a bulwark against Russia) and at the same time secured the gratitude of Mohammed Ali. France was discredited in Egypt, and thenceforth Mohammed Ali gave no support to any scheme for a canal at Suez. At the same time, he encouraged British use of the overland route to such an extent that the number of travellers using it increased from 275 in 1840 to 3000 in 1846.[7]

The English also hoped to construct a Suez-Alexandria railway, and carried out a preliminary survey in 1834; but France and Austria opposed this plan as violently as Britain opposed the canal. Not until Mohammed Ali died, in 1849, to be succeeded by his Anglophile grandson Abbas, did they make any headway with this project. Abbas granted a contract to the railroad engineer Stephenson, and by 1854, when Abbas died, track had been laid from Cairo to Alexandria and construction was under way to Suez.

De Lesseps and The Building of The Canal

With Abbas' death all was changed. The new Pasha, Sa'id, had been tutored in his youth by Ferdinand de Lesseps, son of the then French Consul-General in Egypt. The younger De Lesseps himself had served as a consulate officer in Egypt until 1837, and during his stay became an enthusiast

for the old French canal scheme, to which he devoted his energies for many years without success. Learning that Sa'id was now in command, De Lesseps hurried back to Egypt and in November, 1854, was granted a concession to construct a canal from the Red Sea to the Mediterranean. The terms were extremely generous. Egypt was to furnish the corvée (forced labor) and get 15 per cent of the profits; the concession to run for 99 years was tax free. There was only one difficulty: construction was not to start until the Turkish Sultan - still the nominal ruler of Egypt - had ratified the concession.

The Sultan, however, was controlled by the British, who opposed the canal as strongly as ever. Furthermore, France and Britain were allied with Turkey against Russia in the Crimean War, and France feared to alienate Britain by pushing the canal project. So the Sultan withheld his approval, and De Lesseps received no official support either abroad or at home. However, he pushed on with his surveys, and by 1856 was able to get an International Commission to report that a direct route across the Isthmus, together with ports at each end of the canal, would cost no more than £6,000,000. Even though the British government continued to view the canal as a French political maneuver, many British businessmen, and some political leaders, now began to support the project.

In 1858 De Lesseps's company began to sell shares in the canal company, whose capital totalled 200,000,000 francs. More than half the shares were bought in France, almost a quarter by the Egyptian government; most of the remainder were alloted to Great Britain, the United States, and Russia, but were not taken up in those countries. De Lesseps announced that Sa'id had agreed to buy them for the Egyptian government, and that the capital was now fully subscribed. Even though Sa'id denied that he had agreed to buy the extra shares, and warned De Lesseps not to begin construction without the Sultan's approval, the apparent financial consummation of the canal company had convinced the French government that De Lesseps deserved complete support.

Armed with official assurances, in 1859 De Lesseps defied the Sultan, began work on the canal, and even persuaded Sa'id to supply the corvée. Britain protested, however, that the corvée recruitment was slavery, and construction came to a virtual standstill until Sa'id's death in 1863. His young successor, Ismail, not only agreed to take up the additional shares Sa'id had rejected, but also agreed to have Napoleon III arbitrate differences between Egypt and the canal company. As a result, corvée labor was outlawed, Ismail was fined £1,520,000 for failing to supply it, and had to pay the company an additional £1,840,000 as compensation for abandoning the Sweetwater Canal concession, ownership of which Ismail considered essential to Egypt's independence. Under a Liberal government, Britain ceased to oppose the canal, and in 1865 the Sultan finally gave his permission. With these difficulties disposed of, the digging of the canal went on apace. The work was completed within four years, and the canal formally opened with great pomp and display by many governments on November 17, 1869.[8]

Physical Features of the Canal

The course of the canal follows a natural depression, through which the Mediterranean and the Red Sea were connected at the end of the Tertiary period. Lakes, salt marshes, an extensive sand plain, and a few sand hills occupy this depression today. No blasting was required, but the construction of the entrances, particularly at the Mediterranean presented serious problems. At the Red Sea end the twin ports of Ibrahim and Tewfik and enclosing breakwaters were built, but their construction was technically simple. At the Mediterranean entrance, however, the shallowness and the soft mud and shifting sand of the bottom, the strong current, and the frequency of heavy seas made it necessary to build long stone breakwaters and do much dredging.

The cost of the canal had been originally estimated at 130,000,000 gold francs (about $41,800,000), but by the time it opened 287,000,000 francs (about $92,414,000) had been spent. The long delays in construction added materially to the cost, as did the increased expense of excavation after forced labor was withdrawn in 1863. And there were many technical difficulties and supply problems, the necessity of which had not been anticipated, notably the constructing of a fresh-water canal from the Nile. Excavation costs were low as long as forced labor was used (the laborers were paid at the rate of six to eight piasters - 1 1/2 to 2 francs - a day), but increased substantially after 1863, when "free" labor had to be hired.

The Suez Canal is essentially a 104-mile-long, lockless, sea-level ditch. In 1869 it was only 200 feet wide, with a maximum depth of 26 feet, and passage through it was permitted only to ships of less than 13 1/2-foot draft. The canal has been progressively widened to 500 feet wide at water level and 196 feet wide at its 33-foot depth, and the depth of the main channel is now 45 feet. Curves have been reduced and in many places faced with stone. Ships drawing 35 feet can now transit, and the improvement program underway when the Egyptian government nationalized the canal would make the channel of sufficient depth for ships of 36-foot draft.

Until recently large ships could pass each other only in Great Bitter Lake. Elsewhere they had to moor to the bank until those coming from the opposite direction had passed. In 1951, however, a seven-mile bypass north of Lake Timsah and about thirty miles from Port Sa'id was opened.

In addition to these improvements, constant dredging is necessary to keep the channel clear of silt eroded from the banks and sand blown in from the bordering desert. As the size of ships has increased, so has the problem of erosion, for the thrust of water ahead of these ships and the wake behind damage the banks. Masonry, walls, steel piling, and heavy layers of bitumen are used as preventive measures. (For the canal ports see Chapter 10, Transport and Communications.)

Navigation of the canal is not easy. The wheelsman must constantly fight to hold his ship against the water that compresses between it and the

banks, and he must often contend with crosswinds. Assistance is provided at all times by trained pilots, who board entering ships at both entrances and ride as far as Ismailiya, where they shift over to ships coming from the opposite direction. Ships are required to make the run in convoys of eight to ten and are limited to a maximum speed of 7 1/2 knots. Normal time for making the passage between the terminal ports is about 15 hours.

Canal Traffic

In planning his canal De Lesseps estimated that the annual traffic through it might eventually reach 3,000,000 net tons. That figure was reached by 1880 and was doubled by 1890. In 1948, 55,000,000 tons passed through the canal, and in 1955 double that amount - 115,756,000 tons - nearly one-sixth of all the cargo moved by sea that year in the world. The Suez Canal Company was authorized by the original Act of Concession to levy transit tolls up to, but not to exceed, 10 gold francs (equivalent to $3.42) per net ton[10] and the same amount per passenger. Thanks to the increases in traffic, the company was able to reduce tolls twenty-seven times. The last reduction, on July 15, 1954, brought the toll down to 34 Egyptian piasters ($0.945) per net ton for loaded ships and 15.5 piasters ($0.444) for ships in ballast. This was less than one-fourth of what was charged in 1894. Transit dues for passengers were suspended in 1950.

From the beginning the amount of northbound traffic exceeded southbound. The gap has steadily increased (see Tables 1 and 2). In 1910 southbound cargoes amounted to 8,429,000 tons (38 per cent of the total traffic) and northbound to 14,006,000 tons (62 per cent). In 1955 the proportion was 20,082,000 tons southbound (18 per cent) to 87,426,000 northbound (82 per cent). But the character of the cargoes transported through the canal has changed radically through the years. In 1910 four groups of products accounted for 68 per cent of the northbound tonnage: cereals (23 per cent), oil seeds (23), textiles and fibers (13), and ores and metals (9). Coal and coke ranked first in southbound traffic, contributing 12 per cent of the total.

Various world market and production changes have from time to time altered the character of the cargoes in one direction or the other. But the exploitation of petroleum in Iran and the Arabian peninsula is responsible for the most radical shift of all. In 1910 petroleum constituted only one per cent of the northbound tonnage. By 1939, 29 per cent of the northbound tonnage was crude petroleum and, in 1955, 72 per cent. In the latter year 65 per cent of the total tonnage passing through the canal in both directions was petroleum and petroleum products.

Most of the northbound cargoes at first came from India; they now originate in Iran and the Arabian peninsula. Britain's share of the traffic, at first three-fourths of the total, is now less than one-third. Even the nationality of the shipping fleets has changed as a result. Norwegian tonnage is now in second place, as shown in Table 3, and Swedish and Danish tonnage has become prominent - not because Scandinavians consume much

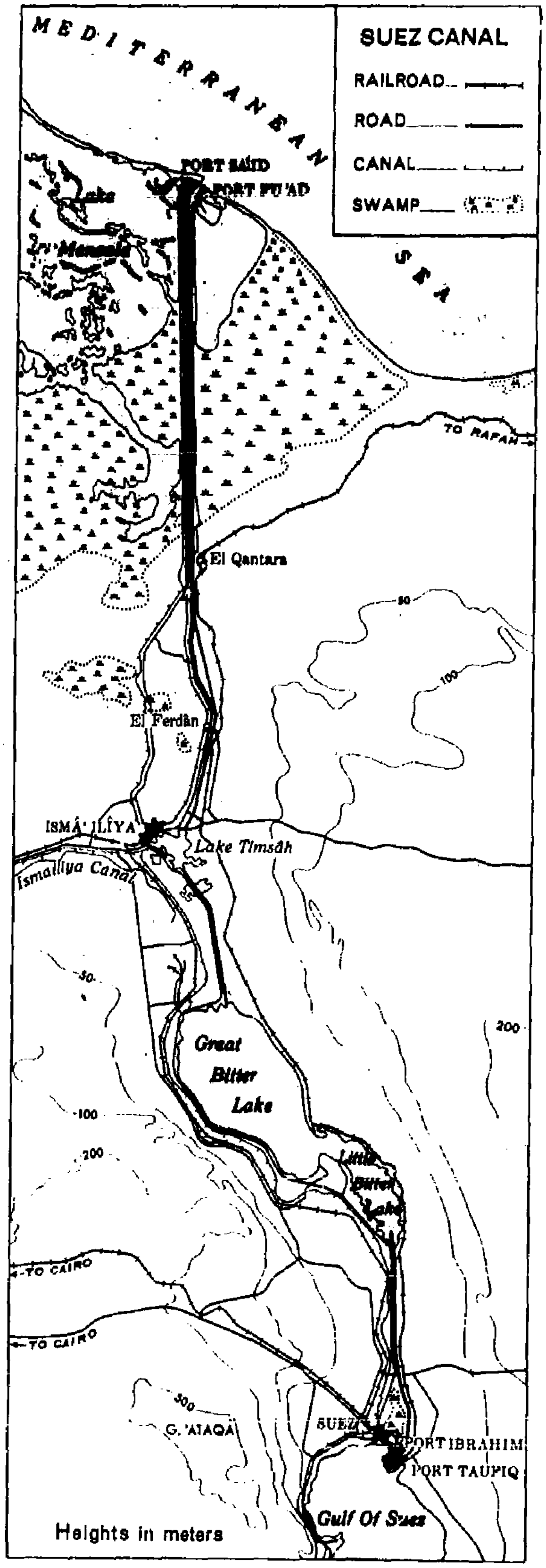

SUEZ CANAL
RAILROAD
ROAD
CANAL
SWAMP
MEDITERRANEAN SEA
PORT SAÏD
PORT FU'AD
Lake Manzala
TO RAFAH
El Qantara
El Ferdân
ISMÂ'ILÎYA
Lake Timsâh
Ismailiya Canal
Great Bitter Lake
Little Bitter Lake
TO CAIRO
TO CAIRO
G. 'ATAQA
SUEZ
PORT IBRAHIM
PORT TAUFIQ
Gulf Of Suez
Heights in meters

Table 1 - Suez Canal Traffic (in thousand metric tons)*

Northbound					Southbound				
	1910	1939	1954	1955		1910	1939	1954	1955
Petroleum and products	92	4, 989	56, 978	66, 893	Petroleum products	279	229	6, 084	1, 905
Minerals and metals	1, 192	1, 055	4, 552	5, 300	Worked metal and machinery	474	1, 686	3, 169	3, 759
Cereals	3, 282	2, 113	2, 189	2, 488					
Oil seeds, copra, etc.	3, 060	2, 874	1, 765	1, 803	Fertilizers	81	584	2, 089	2, 454
Textiles and fibers	1, 854	1, 142	1, 629	1, 744	Cement	109	586	1, 990	2, 683
Rubber	a	a	1, 217	1, 349	Sugar	a	a	1, 563	996
Sugar	a	a	1, 046	964	Paper and pulp	a	362	568	611
Others	4, 526	4, 988	5, 135	6, 985	Cereals	a	105	504	489
					Coal and coke	1, 014	273	75	116
					Railway equipment	714	193	385	467
					Salt	375	583	470	497
					Others	5, 383	2, 916	5, 473	6, 105
Totals	14, 006	17, 161	74, 511	87, 426	Total	8, 429	7, 517	22, 370	20, 082

*From The Suez Canal, published by the Suez Canal Company, 1952, pp. ix-xiii; Economic Bulletin, National Bank of Egypt, Vol. 8, No. 2, 1955, pp. 128-132; and Le tropic du canal de Suez, Mouvement Maritime, Année 1955.

a - no information available.

Table 2 - Summary of Suez Canal Traffic

	1918	1928	1938	1948	1952	1955
Number of ships	2,522	6,084	6,171	8,686	12,168	14,666
Net tonnage (in millions)	9.2	31.9	34.4	55.0	86.1	115.7
Passengers (in thousands)	106	318	480	455	571	521
Cargoes (in million tons)	7.8	32.5	28.7	49.3	83.4	107.5
Southbound cargoes (in million tons)	1.6	11.9	7.7	9.7	22.0	20.1
Northbound cargoes (in million tons)	6.2	20.6	21.0	39.6	61.4	87.4
Petroleum and products in northbound cargoes (in million tons)	0.7	3.3	5.2	28.9	45.9	66.9

Middle East oil, but because they have many tankers in their merchant fleets. It would appear from the table that the tonnage carried in American tankers fell from second to ninth place between 1947 and 1955. Actually the tonnage carried in tankers of American ownership still ranks third, since the majority, if not all, of the tankers under Liberian and Panamanian registry are American owned. (See Tables 4 and 5.)

Table 3 - Registry of Ships in Suez Canal Traffic

(By percentage of total net tonnage)

Registry	1929	1937	1947	1954
Great Britain	57.1	47.3	47.7	32.1
Germany	10.3	9.1	---	---
Netherlands	10.0	7.7	6.5	4.4
France	6.5	5.0	3.9	9.2
Italy	4.6	16.1	3.9	6.7
United States	2.1	1.5	20.0	3.0
Norway	2.1	4.5	7.3	13.9
Liberia	---	---	---	9.3
Panama	---	---	---	7.3
Sweden	---	---	---	3.5
Denmark	---	---	---	2.3
Others	7.3	8.8	10.7	8.3

Economic Bulletin, National Bank of Egypt, and Suez Canal Company Reports.

Table 4 - Twenty-five Years of United States Trade Via Suez Canal

(In thousand tons)

Year	Imports	Exports	Total
1929	2, 247	615	2, 862
1937	1, 255	235	1, 490
1938	697	192	889
1946	1, 830	1, 338	3, 168
1947	2, 547	2, 083	4, 630
1948	5, 382	1, 937	7, 319
1949	7, 010	2, 067	9, 077
1950	8, 722	1, 367	10, 089
1951	5, 462	3, 271	8, 733
1952	6, 156	4, 079	10, 235
1953	8, 214	2, 500	10, 714
1954	8, 741	1, 557	10, 298

Table 5 - Principal Commodities in United States

Trade Via Suez Canal, 1954

(In thousand tons)

Imports		Exports	
Crude petroleum	6,592	Petroleum products	624
Manganese	842	Cereals	145
Rubber and latex	412	Machinery	121
Manufactured jute	148	Lubricating oils	110
Jute fiber	55	Chemicals and sulphur	106
Sugar	95	Manufactured metals	89
Fruit	53	Coal and coke	26
Tea	30	Others	336
Others	514		
Total	8,741		1,557

The Canal Company

Until July 26, 1956, when President Nasser proclaimed the nationalization of the canal, the canal concession was held and the canal maintained and operated by the company organized by De Lesseps in 1858 - the Compagnie Universelle du Canal Maritime de Suez, commonly called in English the Suez Canal Company. This company, although incorporated under French law and having its main office in Paris, was an Egyptian company subject to Egyptian law in all matters not covered by conventions between it and the Egyptian government. The company's Suez concession was to run for ninety-nine-years from the date of the opening of the canal, or until November 17 1968.

The early history of the company was so intertwined with the events that led to the occupation of Egypt by England that the two can hardly be discussed separately. Whatever its future advantages to Egypt, the canal at first impoverished her. As mentioned, the canal cost £16 million to build instead of the £ 6 million De Lesseps had estimated. Of this total, £ 4.5 million pounds came from non-Egyptian shareholders. Egypt (i.e., Sa'id and Ismail) paid all the rest, or about £ 11.5 million: almost 4 million pounds for her shares of stock, £ 3.5 million compensation under the arbitration award, more than 3 million for construction of the Sweetwater Canal which Ismail insisted on "owning," and 1 million for opening ceremonies and sundry expenses. Most of this money had to be borrowed - mainly from French lenders - at ruinous terms, which by 1873 had cost Ismail another 6 million pounds in interest. In order to pay his interest and avoid bankruptcy, in 1874 Ismail tentatively arranged to sell his shares to a French banker, making sure that England heard of the proposed transaction. The Prime Minister, Disraeli, at once protested against the sale on the ground that it would give France almost 100% ownership of the canal.

In a dramatic move, and without the sanction of parliament, which was not in session, Disraeli then proceeded to buy the shares himself for £ 4,000,000. According to legend, as soon as he had them he presented the canal shares to Queen Victoria, saying, "It's yours, Ma'am."

The canal was, however, anything but hers. In the first place, the shares Disraeli acquired represented only 40 per cent of the company ownership. In the second place, while 25 shares were worth one vote, no one shareholder could have more than ten votes, so that Great Britain had only a small minority voice in the company. In the third place, Britain would have no voice at all in the management of the canal until after 1894, since Ismail had already taken his dividends (in advance) up to that year and forfeited voting rights on those shares. Britain naturally protested to De Lesseps, but although almost 80 per cent of the canal traffic was by now British, all she could get was a restoration of the ten forfeited votes and three seats out of the twenty-four on the company's Board of Directors.[11] In 1883 British shipping interests were given ten additional seats.

The purchase of the shares and the position of the company had nothing to do with the fact that Britain now controlled the canal. What mattered was that France, as a result of the war of 1870, was now virtually powerless in the Mediterranean, while Britain was stronger than ever. The canal as a commercial company remained international and predominantly French; the canal as a strategic route could have been taken by Britain, had British interests required it, at any time.

That British imperial interests would eventually require effective control of Egypt was almost inevitable once the canal was constructed, for Britain could not leave this lifeline to India and the East at the risk of capture by another European power, Turkey was too weak to exercise control, and a truly independent Egypt could not be counted on to protect British interests either. The specific occasion for British occupation was this: the sale of his canal shares gave Ismail only a brief respite from bankruptcy. Unable to pay interest charges to his European creditors, Ismail had to submit his finances to the "Dual Control" (British-French), which led finally to the Egyptian army revolt, the bombardment of Alexandria, and the British occupation of Egypt in 1882 - an occupation that lasted, in one form or another, until British troops left the Canal Zone in 1955. However, Ismail's indebtedness was the excuse, not the reason for the occupation; whatever happened in Egypt, England had to safeguard the canal for her shipping.

Meanwhile the canal company continued under international control, unchanged except by increasing prosperity. Shipping might have increased even more rapidly than it did had the British Treasury agreed to reduce transit dues; but British shippers were the chief sufferers, and the shareholders at least had no cause to complain. For example, preference (nonvoting) shares sacrificed on Ismail's behalf by the Anglo-French Controllers for £ 880,000 were earning £ 500,000 a year not so many years later. [12]

Space forbids a detailed account of the earnings and profits of the canal company (see Table 6). In 1955, the last full year of operation before Egypt nationalized the canal, total revenues amounted to $97,596,000 and total expenditures to only $52,300,000. One-fifth of the gross profits were earmarked for canal improvements, one-third were distributed to officers and shareholders, and the remainder - almost half the gross profits - were invested in other securities, mostly in companies outside Egypt, by way of preparation for the end of the canal concession rights in 1968. When Egypt seized the canal, more than $100,000,000 of the company's property was already in such securities.[13] The canal company is therefore still very much in existence even though it no longer owns the Suez Canal. It is deeply interested in the construction of a tunnel under the English Channel, among other projects. [14]

Egypt's connection with canal earnings ceased with the sale of Ismail's shares in the 1870's. For more than half a century Egypt received no direct benefit from the great transport route built by her laborers and paid for mainly by her government. In 1937 the Egyptian government was given two seats on the company's Board of Directors, annual royalties of £E 300,000, and a guarantee that at least one-third of the company's 5000 employees would be Egyptians.

Table 6 - Canal Expenditures and Net Profits*

(In thousand dollars)

	1953	1954
Taxes	1,601.4	2,907.3
Local government	8.6	8.6
Egyptian govt. royalties	2,740.8	3,102.4
General administration costs	3,868.7	3,911.8
Canal and port operation	7,011.4	7,008.5
Canal and port maintenance	6,049.9	6,497.6
Equipment maintenance	4,824.4	4,876.1
Other expenses	5,054.0	4,900.5
Total	31,149.2	33,212.8
Total receipts	63,900.1	61,606.1
Net profit	32,750.9	28,383.3

*Economic Bulletin, National Bank of Egypt, Vol. 8 No. 2, 1955, p. 130.

By 1949, 5 of the 32 directors were Egyptian, 16 French, 9 British (3 representing the government and 6 representing British shipping interests), 1 American, and 1 Dutch. The Egyptian membership was to be increased to 7 in 1964. The 1949 agreement also provided that nine out of every ten administrative posts and four out of every five technical positions in the canal organization were to be held by Egyptians. The Egyptian government was to receive at least 7 per cent of the company's gross annual profits, and never less than E£350,000 (about $1,004,500), in addition to taxes. In 1954 this amounted to about $5,375,000 (about 2.3 per cent of Egypt's government expenditures for the fiscal year 1954-1955).

Other advantages to Egypt included employment for the thousands of workers engaged in construction and maintenance, certain social and medical benefit schemes, and a profit-sharing plan which yielded employees about $3,000,000 in 1954. In addition, the canal has enabled Egypt to disperse her population outside the Nile valley and delta, while the Ismailiya Canal not only supplies water to the Suez Canal Zone but also provides irrigation water and a transport route for a quarter of a million people.

These advantages were small, however, compared with what Egypt has put into the canal and measured against what she feels she suffered as a result of foreign intervention and control. Financial considerations were no doubt important, but political and strategic motives were uppermost in the minds of Nasser and his lieutenants when Egypt seized the canal on July 26, 1956.

The canal has survived this as well as the more recent disturbance. After the nationalization decree there were many predictions that Egypt would find it difficult to run the canal herself. Pilots were found, however - many from Russia, others from Western countries, including the United States - who guided ships in transit as safely and apparently as efficiently as before. If Egypt does not have them now, she will in the near future have pilots enough of her own to assure continued operation of the canal without outside aid.

The second disturbance was more serious. Following the Anglo-French occupation of October-November, 1956 (avowedly to protect the canal from Egyptian-Israeli hostilities), Egypt deliberately blocked the canal by sinking shipping in it. No ships passed through it for five months, until dredging operations undertaken by the United Nations had cleared the canal of obstructions. Most European nations had anticipated having to do without it for a much longer time, and prepared to suffer through one or more hard winters with inadequate fuel supplies, but reserves, supplemented by shipments through pipelines, around the Cape of Good Hope, and from the Western hemisphere, were sufficient to ward off great hardship. Nevertheless, almost as soon as the canal was reopened it was used as much as before; even France lifted its boycott in June, 1957, without any Egyptian compromise as to the management and operation of the canal.

According to the most recent available reports, traffic through the canal is now greater than ever before, despite the fact that passage is for the time being restricted again to vessels of 34 feet or less. In November, 1957, daily passage of ships averaged 47.9, an all-time record. (The average of daily transits was 44.6 in the first half of 1956, the last half year of "normal" operations under the company.) Tonnage through the canal totalled 36,355,000 net tons in the last quarter of 1957, an increase of 22 per cent over the last quarter of 1955.[15]

"Neutrality" of the Canal

The original Act of Concession provides that the canal will "always remain open as a neutral passage to every merchant ship coming from one sea to the other." With Great Britain owning more than 40 per cent of the capital stock of the Suez Canal Company and occupying Egypt as a protectorate, other European powers with extensive shipping interests feared Britain might want to take over full control of the canal. That Great Britain had immediately installed troops to guard the canal against the Egyptian army did not lessen European anxiety. As a result, representatives of Great Britain, France, Germany, Austria-Hungary, Italy, Russia, Spain, Turkey, and Holland met in Constantinople in 1888 and signed a convention guaranteeing free passage through the canal to all vessels of all nations, warships as well as merchant ships, both in peace and in war. No nation might blockade the canal. The canal was to be defended by Egypt and the Ottoman Empire (which expired in 1918), but since Egypt was a British protectorate, Britain took over the defense of the Suez Canal. In the Russo-Japanese War of 1904, Russian warships were allowed through the canal, even though Japan was Britain's ally. In World Wars I and II, however, Britain invoked the defense clause of the 1888 convention to keep enemy ships out of the canal and away from its terminal ports. In World War II there were numerous air attacks on shipping in the canal by German and Italian planes, but British and Egyptian land and naval forces guarding the canal were able to prevent any serious interference with Allied traffic through it.

The Anglo-Egyptian Treaty of 1936, which ended British control in Egypt in all other respects, provided for the retention of British troops in the Canal Zone until the British government was convinced that the Egyptians could be entrusted with defense of the canal. Promises during and agitation after World War II led at last to an agreement in October, 1954, that all British forces would be withdrawn in twenty months. The agreement permits the British to reactivate the Canal Zone posts up to 1961 in case of an attack on Egypt or on its Arab neighbors.[16]

Since the creation of the state of Israel, before as well as after the nationalization of the canal, Egypt has steadily invoked the defense clause of the 1888 convention in order to forbid passage through the canal to Israeli ships and to ships carrying cargoes to or from Israel. Other nations have not been denied passage, but the threat of stoppage - not to mention the actual closing of the canal in 1956-1957 - has forced those Western powers most concerned with East-West shipping (principally Middle East oil) to safeguard their positions by undertaking pipeline construction, reactivating the Cape

route, and other economic and strategic alternatives. Even in the absence of strong military power to back it up, Egypt's effective possession of the canal immeasurably strengthens both her strategic position and her bargaining power.

NOTES

1. Charles W. Hallberg: The Suez Canal, Its History and Diplomatic Importance, Columbia University Press, New York, 1931, pp. 26-27.

2. The Geography of Strabo, translated by H. C. Hamilton, and W. Falconer, London, 1857, Vol. 3, Book 17, Egypt, p. 244.

3. Hugh J. Schonfield: The Suez Canal in World Affairs, Constellation Books, London, 1952, pp. 1-5.

4. Ibid., p. 7.

5. Quoted in ibid., pp. 10-11.

6. John Marlowe: Anglo-Egyptian Relations 1800-1953, Cresset Press, London, 1954, pp. 40-43.

7. Ibid., pp. 47-49.

8. Ibid., pp. 62-71.

9. Halford Lancaster Hoskins: British Trade Route to India, New York, 1928, p. 365.

10. The measure used was the "Suez net ton," an assessment according to ships' useful capacities at the time of transit. See Claude E. Boillet: The Effect on Oil Prices of Suez Canal Tolls, The Oil Forum, November and December, 1954.

11. Marlowe: op. cit., pp. 73-76.

12. Ibid., pp. 77-78.

13. Hoskins: "The Suez Canal," Current History, Vol. 33, No. 195, November, 1957, pp. 257-262, reference on p. 260.

14. Humphrey Slater and Correlli Barnett: The Channel Tunnel, Allan Wingate, London, 1958, pp. 188-189.

15. Petroleum Press Service, Vol. 25, No. 3, March, 1958, p. 104.

16. Marlowe: op. cit., pp. 79-83.

12. EGYPT AND THE WORLD

Only a generation ago a renowned political geographer wrote of Egypt that "sea and desert enclose it. Egypt may agitate and riot and boycott as much as it wishes, yet it remains isolated from the rest of the Moslem world either from the standpoint of effective resistance or from the standpoint of exercising its power in distant countries, so long as the sea is under European control." [1] Yet today Egypt may fairly claim leadership of the Moslem world, and Egypt's policies shake West and East alike.

How did it come about, this transition from a backward sea-and desert-girt land of minor regional significance to the strongest Middle Eastern power, even an aspirant to world power? Egypt is still sea-and desert-girt; and Egypt is still poor in material goods, even poverty stricken. The chief differences are not physical, but political and psychological. One is that Egypt is no longer a double colony, in theory the province of the Ottoman Empire and in practice a principality of the British Empire, but is now an independent nation in her own right. Another reason is that Egypt is no longer dominated from within by a venal monarchy and corrupt aristocracy, but by military leaders who, whatever their faults and excesses, are undoubted patriots and have tremendous prestige with their fellow Egyptians.

The revolution of 1952 gave Egypt for the first time in modern history the conviction that she was in command of her own affairs. If those affairs do not prosper - and so far they have - it cannot be said that her leaders have not devoted themselves to them. In their personal lives, Nasser and his lieutenants maintain an almost puritanical austerity and a rigid honesty. They behave more like leaders of a Crusade than like rulers of a modern state, but then they insist that they are, after all, Crusaders.

On the home front, they have taken steps to dispossess the aristocracy and to distribute lands among the fellahin. Even if most of the land reform is still on paper, even though land reform alone could never assure Egyptians a reasonable standard of living, the social and political impact of the program is prodigious both at home and abroad. As one authority on the Middle East states,

> "The Egyptian reform is so far the only serious attack on rural poverty in the Arab World, and the hopes which it raises outside Egypt are inevitably as important as its achievements inside the country." [2]

And as another observer puts it:

> "The Egyptian revolution is...basic...and significant for the whole area....In the perspective of history it will be to the Middle East what the French Revolution was to Europe. It, too, had its self-seeking leaders, its power cliques, its political nation-

> alism; but it let loose forces that finally changed the pattern of social life in most of Europe. That is what the Egyptian revolution has begun to do in the Middle East and that is why it strikes fire in some form in every country."[3]

In foreign affairs, Egypt's present rulers have repeatedly demonstrated - the Suez nationalization is only the most striking instance - that they are willing to oppose any nation or combination of powers in pursuing national goals. Egypt's successful revolution, her successive triumphs in brushes with Western "colonial" powers, and her charismatic leaders have deeply impressed other Middle Eastern peoples, who now look to Egypt both for ideological and for military support.

Finally, external events have also contributed to Egypt's new position of power and prestige. One is World War II, which left all European powers weaker in the Mediterranean, and stimulated many Middle Eastern countries to make effective what had so long been promised them - self-government and national independence. Another is the cold war, which has put Egypt and the whole Middle East in a strong bargaining position between West and East. A third is the creation of the state of Israel. While Egypt's defeat by Israeli forces in 1948 was a humiliating affair, it occurred while Egypt was under the old regime, and no Egyptian believes that Egypt was bested in the battle of 1956, not even by the combined forces of Israel, Britain, and France. The significance of Israel is that Egypt has a mortal enemy on her own border, an enemy which she shares in common with Syria, Jordan, and other Moslem states, an enemy against which they must always be prepared to fight for survival. The apparently crucial nature of this struggle, in which Egypt has taken the lead, has fostered the sense of crisis in which Egypt's primacy and prestige best flourish. Similarly, Egyptian sympathy with the national aspirations of other Moslem countries against Britain and France - most notably in North Africa - enables her to pose as the champion of freedom and potential leader of an Islamic super-state. So it is that the non-Arab people of the Nile Valley have emerged as leaders of predominantly Arab peoples separated from them by hundreds and even thousands of miles of sand and sea.

In direct proportion to her increasing strength in the Middle East, Egypt has become a power to be reckoned with in the wider world. Since the postwar decline of British and French influence there, the Arab lands have figured as a power vacuum - a vacuum which both East and West have been most anxious to fill. But if there ever was a time when Egyptian ideological allegiance could be won by one side or the other, this time is now past. Under her modern Saladin, Egypt is satellite to no power bloc, and will embark on no Crusade but one of her own making. Were Egypt merely "neutral" in the cold war, offers of money or arms might sway her purpose; but Egyptian national aspirations now require more than mere survival; they transcend the conflict between East and West. Of these aspirations the great powers will remain ignorant at their peril.

Egypt in the Middle East

Egypt's present position of leadership in the Arab world rests on two fundamental and unchangeable facts: (1) her strategically dominant position in the Middle East, and (2) the cultural unity of most of that area. Neither of these facts is new. What is now called the Middle East - an area stretching from Morocco at least as far East as Iraq and perhaps to Pakistan - has been Moslem for more than a millenium, except for relatively small enclaves and minorities; and this religious homogeneity has always transcended ethnic and social differences.

Egypt has been the strategic center of gravity of the Middle East for a still longer period Her relations with Syria are ample illustration of this fact. Both countries have often been subject to other empires. But when Egypt has been independent, it has generally ruled Syria as well. Between 878 and 1516 A.D., for example, Egyptian control in Syria was almost uninterrupted. Strategy, not religious or cultural nationalism, was what counted. When Egypt ruled Syria she dominated the whole land-bridge - or barrier - between Europe and the Far East.

Today Egypt and Syria are again one nation, but Arab nationalism is said to be the goal that inspired their union. Arab nationalism is a force of great importance; but it is not the only motive that Egyptians recognize. With Egypt in control of both the Suez Canal, and of Syrian oil pipelines, control of the old land-bridge must seem, at least to oil-dependent European nations, as signficant as ever in the past. What is more, now as in the past, Egypt commands that union. Nasser is president of the United Arab Republic, and Syria is little more than a vassal.

It is not only ideological leadership that accounts for Egypt's primacy in the Arab world. In comparison with Syria - and indeed with most other Middle countries - Egypt has internal unity, a firm agricultural base, excellent communications, general economic stability, and - not least - three times the population of any of her near neighbors. The remainder of this chapter will emphasize that noneconomic factors are significant in Egyptian foreign relations. But in the last anslysis Egypt's position rests - despite many economic tribulations - upon material power as well, material power that is assured as long as the Nile continues to flow.

Egypt's role as a leader of Arab nationalism is relatively new. Until quite recently most Egyptians espoused Arab cultural unity but fought shy of political pan-Arabism. Under the Ottoman Empire the Arabs from Tunisia to Iraq were unified, but it was unity under a foreign empire, and a weak and crumbling one at that, hardly an association of which Moslems, much less Arabs, could be proud. From the time of Mohammed Ali, early in the 19th century, other vassals of the Sublime Porte looked up to Egypt precisely because Egypt had gained partial independence from Turkey.

Egyptian aspirations remained national, rather than pan-Arab, even after the dissolution of the Ottoman Empire in World War I. Egypt was still a British protectorate; Egyptian nationalists were perhaps too busy struggling for independence from Britain to take part in larger and more nebulous crusades. But Egyptians had other cause, they believed, to eschew pan-Arab

movements. One reason was the suspicion that European nations - especially Britain - were trying to foster such unions for their own devices. Another was the fear that any such composite of weak Arab states would inevitably be as weak as its weakest link. As the Egyptian nationalist leader of the 1920's, 'Abd al-Rahman 'Azzam (later secretary-general of the Arab League) replied when asked what he thought of joining together the Arab countries: "If you add one zero to another zero, then you add another zero, what will be the sum?"[4] A third reason for Egyptian diffidence was the feeling that Egypt was somehow different from, and better than, the Arab countries, because of its distinguished cultural past. The discovery of relics following Napoleon's invasion and the subsequent growth of the science of Egyptology had spurred the so-called Pharaonic movement among Egyptian intellectuals. Extreme Pharaonics proposed that Egypt abandon Arabic and the Koran and return to hieroglyphic writing and the ancient gods; and even moderates felt that it would be wrong to submerge the rich Egyptian heritage and unique personality in pan-Arabism or pan-Islamism. They regarded the Arab countries as backward and second rate. For a wide variety of reasons, Egyptian political and intellectual leaders avowed nationalish and separatist ideals; they considered their problems and their destiny Egyptian, not Arab.

At the same time, however, Egypt continued to maintain cultural supremacy within the Arab world. El Azhar University has long been an important focus of Moslem orthodoxy. Cairo and Alexandria are perhaps the principal seats of Moslem learning in the Middle East, and Cairo is the largest and most important Arabic-speaking city. Islamic scholars and teachers from all over the world have been trained in Egypt; and Egypt has exported teachers and publicists as far west to Morocco, east to Java southwest to Ghana. Mohammedans everywhere have long looked to Egypt for cultural leadership.[5] Both before and after World War I Egypt was the seat of various pan-Arab societies which have taken the lead in the Arab awakening. Not until the 1930's, however, were politics directly involved in this cultural revival.

This cultural revival was at first politically progressive and, though anti-British, generally pro-Western. In fact, the Moslem Brotherhood was founded in 1928 by xenophobic traditionalists who distrusted the Westernizers, and who wished to return to ancient virtues under a theocratic Islamic state. The headquarters of the Moslem Brotherhood was not, and is not today, typical of Egyptian pan-Arabism. However much they mistrust the West, Egyptians are essentially modernists, not traditionalists in their approach; Arabia, not Egypt, remains the stronghold of Islamic theocracy.

Serious Egyptian interest - as opposed to the extremism represented by the Moslem Brotherhood - in pan-Arabism began in the 1930's with the establishment of a number of clubs, journals, and organizations centered in the universities and among the professional elite, and culminated in the formation of the Arab League in 1945. Although Egypt was active in the Arab League and used it as an instrument of international policy, few Egyptians mistook the League, which was a loose confederation at best, for genuine Arab unity.

Dynastic and other rivalries pitted Iraq against Syria, Jordan against Iraq, Arabia against all three; even Syria and Egypt were at odds. Some disgruntled members considered the Arab League as a masterpiece of British strategy, while in the Levant many suspected Egypt was using the League to promote her own interests rather than Arab goals in general. The palestine war of 1948 almost destroyed what little Arab solidarity remained, and the humiliating Israeli debacle led Egypt to accuse the Arab countries of letting her down. Nevertheless, Egypt joined the other Middle East countries in the Arab Collective Security Pact (1950-51).

After the revolution of 1952 and the overthrow of the monarchy Egypt again became the center of pan-Arabism. On the one hand, the revolutionists blamed past failures - including defeat in the Israel war - on the monarchy, thus rehabilitating pan-Arabism in Egyptian eyes. On the other hand, the success of the revolutionary junta in its negotiations with Britain (the Sudan question and the evacuation by British forces of the Suez Canal Zone) gave Egypt great prestige throughout the Middle East. Egypt had managed to eliminate foreign interests; she was now in a position to help her less fortunate neighbors, for none of the small countries of the Levant and North Africa could hope to gain independence by themselves. Their only hope, the Egyptians said, was for unity under Egyptian leadership. And Egyptian aid and moral backing in Morocco gave credence to this view.

Egypt's prestige in the Arab world was now sufficient to survive the Baghdad Pact, a military alliance between Turkey and Iraq in 1955 designed to counteract Egyptian hegemony in the Levant. This effort to neutralize Egypt's power in the Middle East failed, because (1) no other Middle Eastern powers save Iran later joined the Baghdad Pact, and (2) Britain did. The enabled Egypt to attack the Pact as a Western "conspiracy" aimed at undermining Arab unity, and preventing the liberation of the remaining Middle Eastern dependencies from colonial rule, and diverting attention from Isreal. To counteract the Baghdad Pact Egypt concluded mutual defense pacts with Syria and Saudia Arabia, and succeeded in acquiring arms from Czechoslovakia without becoming attainted with communism. As a result, Iraq was virtually isolated from the other Arab countries, and so much pressure was put upon Jordan to reject the Baghdad Pact and British ties that in 1956 King Hussein dismissed Glubb Pasha from the Arab Legion and signed mutual defense pacts with Egypt and Syria.[6]

Sabotaging of the Baghdad Pact was followed by other events - notably the nationalization of the Suez Canal - which increased Egyptian prestige in the Arab world. Equally significant, pan-Arabism became an accepted and integral tenet of Egyptian official policy. According to her 1956 con stitution, Egypt is a sovereign independent state, but also "an organic part of a greater Arab unity... an integral part of the Arab Nation."

It would be as great an error to suppose such statements to be merely vague, visionary hopes as to assume that the whole Middle East has acquiesced in Egyptian suzerainty. On the one hand, Nasser's achievement in uniting Egypt with Syria (Feb. 1, 1958) and then federating his United

Arab Republic with Yemen (March 8, 1958) has not only emotional prestige but also practical significance. Despite the fact that these three countries have no common boundaries, the union may still be viable, as the continued existence of a divided Pakistan shows; and the United Arab Republic has the advantage of a common language. Economically, Egypt with her surplus population and Syrua with her empty lands are both in a position to benefit. Strategically, the union of the two creates a pincer that threatens Israel; and indeed it is a stated objective of the union to "restore" Palestine. And linkage of Yemen looks toward the "liberation" of southern Arabia (i.e., Aden) from British control. Finally, the new union unites nearly 32,000,000 people - 24,000,000 Egyptians, 4.500,000 Yemenis, 4,000,000 Syrians, which gives it a greater manpower potential than any other Moslem nation save Pakistan and Indonesia.

On the other hand, Egypt has so far failed to win over the remaining Arab states. Instead, the Egypt-Syrian union provoked the formation of a rival Arab Federation between the two Hashimite kingdoms of Jordan and Iraq - a federation with one advantage contiguity - the Egyptian union lacks. Egypt has since devoted almost as much energy to denouncing Iraq and Jordan as the tools of imperialist Western powers as she has in celebrating her own union with Syria and Yemen. Egyptian relations with other Arab states, especially Lebanon and Arabia, also remain problematical.

Nevertheless, these developments may make more likely the unification of the Arab world, probably under Egyptian leadership. Both the recent Arab unions give evidence of satisfying the age-old desire throughout the Middle East for a pan-Arab nation. Whatever the official response in the Arabian kingdoms, and regardless of specific criticisms of Egypt and of Nasser, most Arabs generally agree that a Nasser of some sort is needed. It is not easy to gainsay Nasser's own statement that only Egypt is big enough to moblize the other Arab nations to realize their own destin. To be leader of the revolution is to accept "the role in search of a hero." [7] The strength of this role and the popularity of Nasser is that he is no mere ambitious Saladin, no secular caliph, but the leader of the revolution which is to abolish injustice and eventually, perhaps, poverty as well. Egypt's union with Syria is not only an extension of Egyptian power over a vassal state; it is an extension of the principles of Egypt's social revolution, "a gamble," as a Beirut newspaper put it, "against the Pashas of Baghdad and Riyadh." Iraq, Jordan, and Saudi Arabia are still under dynastic monarchies; Egypt and Syria are, at least in theory, republics, and to the massesin the Arab cities everywhere their union represents the union of "free"peoples and an assault against the old order with all its social and economic injustices, as well as against the Western" imperialists" who are said to support that old order. [8]

Egypt in Africa

As political and social leader of the Middle East, Egypt transcends Africa; her cultural destiny is with the Arab nations of the Fertile Crescent. But there are Arabs and non-Arab Moslems in Africa, and to some extent Egypt is there leader too. Nationalists in what was French North

Africa - El Maghreb - receive from Egypt both sympathy and practical aid; the Algerian rebels against France probably get more effective help from Egypt than they do from Tunisia. To the east and the south, Eritrea and the Sudan, with large Moslem populations, are spiritual vassals of Egypt, though their political leaders may mistrust Egyptian motives and resist Egyptian claims for control. Even beyond the Sahara, in northern Nigeria and Ghana, Moslem peoples - Negro, not Arab - regard Cairo as their African Mecca.

Egypt's main role in Africa, however, is one of dependence. Whether or not she dominates the religion and the culture of her neighbors, in the last analysis Egypt's very survival requires the friendship, or at least the passive cooperation, of the inhabitants of Sudan Ethiopia, Kenya, Uganda, Tanganyika. For every drop of water in the Nile originates in or flows through these coun before it reaches Egypt, and without the Nile Gypt would perish. Not all the dams, storage systems, or canals in Egypt, now or in the future, existing or proposed could avert disaster if the Sudanese, for example, decided to undertake hostile operations.

There are two basic ways of looking at the problem of Egypt and the Nile. The Egyptians consider themselves unfortunate in being downstream on the river, and in having no tributaries which arise within their territory. The other Nile countries view Egypt as a potential threat, for the only was Egypt can control the Nile is by conquest of its upper reaches. Egypt has in the past claimed parts of Ethiopia and the Sudan, but these claims have not been taken seriously in modern times, and Egypt has never attempted any conquest. Eschewing forcible acquisition, Egypt emphasizes the "unity of the Nile" and urges joint administration of the river.

Administration of the Nile involves far more than protection of present works. It includes such future improvements as the High Dam at Aswan, the draining of the Sudd swamps, and the century storage plans at lakes Albert and Victoria. All these schemes will be of much more benefit to Egypt than to any of the other countries; in fact, if the plans are carried out, thousands of people in these countries will be made homeless. But without such works Egypt can neither expand her agricultural and irrigable land nor find room for her rapidly growing population.

Egypt, then, is the supplicant for water from the Nile, both for what she now receives and for the additional water that dams and other improvements would make available. For all this Egypt must retain the cooperation of the Sudan, of Ethiopia, of Great Britain as custodian of Kenya, Tanganyika, and Uganda. But Egypt needs more than permission. In the case of some improvements, she will have to pay compensation to people dispossessed by flooding. Most of all, these improvements are expensive; if Egypt wants them, will have to pay for them, wherever on the Nile they are located. And Egypt does not have much capital of her own. She may be able to borrow enough from the Soviet bloc to build the High Dam above Aswan. But whether the other countries would permit Russian-dominated construction of projects in their territories is doubtful. And dams in lakes Albert and Victoria,

at least, would certainly require British friendship and perhaps British funds. Egyptian dependence on the upper reaches of the Nile should not be lost sight of in assessing Egypt's relations with East and West.[9]

Southern Nile projects are not imminent, however, and Egyptian relations with British Africa in the future can scarcely be surmised. But the High Dam above Aswan is believed - at least by Egyptians - to be on the point of construction, and Egyptians place most of their hopes for the economic future of the country on the additional water that dam will yield.

The proposed High Dam will flood a considerable area in the northern Sudan. When filled, the reservoir above it will cover the whole tract of inhabited and cultivated land around Wadi Halfa and deprive 75,000 Sudanese between the Egyptian border and the Second Cataract of their lands and livelihoods. They will have to be moved to new irrigated lands, probably several hundred miles away. But although the Sudanese dislike the prospect of losing this territory, they are more or less resigned to it a necessity, provided suitable reparation is made. Indemnification of the Sudanese thus dispossessed is not the main obstacle Egypt faces, however. A more serious problem concerns the division of benefits between the two countries. Egypt has three times the population of the Sudan and her people depend wholly upon the Nile for their livelihood; but the Sudan has a thriving cotton industry (competitive with Egypt, to make matters more difficult) and also wants more water for irrigation. The Sudanese will not consent to the building of the dam until a distribution they feel equitable has been agreed upon.

The first Nile Waters agreement, drawn up in 1929 between the British and the Egyptians, allocated to Egypt 40 milliard cubic meters of water a year and to the Sudanese 2 milliard. Since then, thanks to various improvements, the assured supply has increased by about 25 per cent, and the allocation has been revised: the Egyptians now have a right to receive 48 milliard cubic meters, the Sudanese to 4 milliard - twice what they got originally. The Sudanese are far from satisfied with the existing arrangements, however, which were made when they could use only a small quantity of water for irrigation. Today Sudanese needs are far greater than they were a decade or two ago, several major irrigation. Today Sudanese needs are for greater than they were a decade or two ago, several major irrigation projects have had to be turned down for lack of adequate water supplies.

Egypt is now willing to be more generous with the Sudan, but what the Egyptians consider ample the Sudanese regard as cruelly inadequate. Estimates on the mean annual flow of the Nile at Aswan vary from 80 (the Egyptian guess) to 84(the Sudanese) milliard cubic meters; after deducting a loss of 10 milliard cubic meters by evaporation from the High Dam, the Egyptians would increase the present allocations to each country in ratio to the size of their populations; ultimately this would give Egypt 62 milliards and the Sudan 8. On the other hand, the Sudanese feel the Egyptians should bear the whole cost of reservoir evaporation, since the water could be stored at Lake Victoria with very little loss; they challenge

the Egyptian estimate of their (Sudanese) population; and claim that a calculation even on the Egyptian basis would give them at least 15 milliards, not 8. But the Sudan rejects this method of allocation in any case, feeling that it gives Egypt a permanent advantage in the development of irrigation. Instead the Sudan suggests scrapping the present agreement entirely and dividing the Nile water according to (1) the cultivable and easily irrigable areas of the two countries, or (2) the present populations of two countries. This would give the Sudan either 35 or 38 milliard cubic meters of water - about twice the total benefit the Egyptians calculate will be realized from the High Dam, and therefore completely unacceptable to Egypt.

No method of calculation is just. Egypt is, to be sure, far more dependent upon irrigation water than is the Sudan, which has both other sources of water and alternative resources; only in the northern Sudan do people rely wholly on the Nile. A division according to population is manifestly unfair. On the other hand, Egypt is able to grow enough cotton with irrigation water to realize far more foreign currency than the Sudanese per capita; the Sudanese hardly have comparable resources for export, and fear that Egypt would like to maintain a monopoly of long-staple cotton. In any case, the problem is a long way from being settled, and relations between Egypt and the Sudan are bound to be strained in the meantime.

Ancient Egypt controlled the northern Sudan as far south as the sixth Cataract. But before the Christian era peoples from the south and east filtered into this region, known as Nubia, and supplanted Egyptian culture. Nubia was Christianized early and held out against Islam until the 14th century, and Egyptian influence remained slight until after 1820, when Mohammed Ali began to conquer countries up the river. During the next half century Egypt advanced even beyond the southern and eastern borders of present-day Sudan, but effective control was always lacking.

Egyptian occupation of the Sudan was abetted and assisted by Britain, then carving out her own spheres of influence in East Africa;since Egypt was more or less controlled by England, conquest of the Sudan amounted to British control there as well. There is no space to detail the ebb and flow of battle there; Sudanese force frequently penetrated far to the north, and the defeat of Gordon at Khartoum in 1874 was a memorable and heroic event. But British control of the White Nile against French claims made reconquest essential, and British and Egyptian forces together completed that conquest by 1899. That year Britain established the Anglo-Egyptian Sudan, a condominium theoretically under joint British and Egyptian rule but actually governed entirely by Britain both during and after the British occupation of Egypt. [11]

Sudanese independence was one of the first fruits of the Egyptian revolution of 1952. British preparation for Sudanese self-government had been dareful but slow; British administrative standards were high, but after half a century of British rule, the Sudan still remained economically backward, socially divided. Egypt under Farouk still claimed

sovereignty there, but in 1953 Neguib and his government abandoned that claim and instead proposed complete independence for the Sudan. After some delay, Britain had to accede to this plan - highly popular in the Sudan - and within three years virtually all British officials left the country. At last arbiters of their own destiny, in a 1956 plebiscite the Sudanese rejected both a link with the British Commonwealth and - despite considerable Egyptian pressure - union with Egypt. The pressure still continues. Despite the close cultural links between the Moslems of northern Sudan and Egypt, the attitude of the Sudanese government toward Egypt has been suspicious rather than friendly.

The most recent boundary controversy illustrates the character of the tensions existing between Egypt and the Sudan. As demarcated by the Anglo-Egyptian condominium agreement of 1899, the boundary between the two countries ran along the 22nd parallel of latitude, crossing Wadi Halfa. Except at the Nile, most of the country the boundary traverses is desert, only sparsely inhabited by nomadic tribes. Nevertheless, certain tribal areas lay athwart the 22nd parallel, and for the sake of convenience a new administrative boundary was established in 1902. As a result, then two areas north of the 22nd parallel - a small patch of land on the Nile north of Wadi Halfa, and a larger territory around the village of Halaib on the Red Sea - have since been administered by the Sudan, and a small area south of the parallel between these two has been under Egyptian rule. When Sudanese independence was declared in 1956, the boundary between the two countries was stipulated merely as the "international boundary" - generally regarded as the administrative one.

In February, 1958 - a month before scheduled Sudanese general elections - Egypt laid claim to the border areas north of the 22nd parallel, alleging that the people there ought to participate in the plebiscite establishing the Egyptian-Syrian union. The Sudanese rejected the claim. As of March, 1958, the dispute remains unsettled and the issue is certainly intricate. What is important in the context of Egypt in Africa is the reaction aroused in the Sudan. Egypt has been suspected of almost every conceivable motive. It is said that vast mineral deposits, perhaps manganese, have been found in the area. It is said that the Egyptians want greater control of the Nile above the proposed High Dam. It is suggested that Egypt seeks strategic control of the Red Sea from as far south as possible. It is said that Egypt wishes to provoke a difficulty with the Sudan as an excuse for invasion, or else to put pressure on the Sudan government in connection with the Nile Waters controversy. Above all, it was thought that Egypt wished to influence the Sudanese elections. If that were the motive, however, it failed, for in March, 1958, the pro-Western, anti-union Premier received increased support at the polls.

The border dispute also revealed that other African neighbors fear Egyptian expansion. In Ethiopia, where Haile Selasse offered his services as mediator, the possibility of Egyptian pressures from Yemen, just across the narrow southern neck of the Red Sea, or from Somalia, the Italian-controlled United Nations trust territory on her southern border, about to become independent, are cause for alarm. In Italian Somalia, pro-Nasser leaders strive to achieve both independence and union with British and French Somaliland, but the moderates in power deplore their agitation. Even Tunisia tends to regard agitation emanating from Egypt as a threat to its moderate government. To sum up, whatever response Egypt elicits among Arab peoples of Africa, the governments of these nearest neighbors are not notably

enthusiastic about their Egyptian neighbor.

Egypt and the Soviet Union

The Soviet Union looms large today in the Middle East, and of necessity in Egypt, for two principal reasons. One is that the decline of British and French influence in that area makes the presence of any aggressive state nearby seem menacing. The other is that Russia claims to stand for the kind of social revolution and anti-imperialism in which Egypt has been the Middle Eastern leader. To see how Russia and Egypt influence each other, one must first know what each has to gain, or believes it has to gain, from the other.

Russian interest in the Middle East has to do with three things: strategic considerations, resources, and ideology and propaganda. The first of these long antedates the present Soviet regime. For almost a thousand years a cardinal goal of Russian policy has been to gain control of the straits - the Dardanelles and the Bosporus - which in turn control the entrances from the Mediterranean to the Black and Caspian seas. In modern times, Russian energies have been directed mainly against Turkey, the guardian of the straits; both before and since the collapse of the Ottoman Empire, Turkey has been hostile to Russian ambitions. A tactic frequently employed by Russia was to gain friends, or control, in the Levant to the south, and thus to encircle Turkey. Russian interests have been great, and her friends numerous, in Syria and in Palestine. In the past, however, Britain and France have had enough power in the Levant to exert some counteracting force. Today this is no longer the case. Russian friendship with Egypt, as the strongest power in the Middle East, and now as master of Syria, is in one respect only the latest of many maneuvers designed to isolate Turkey and achieve a free, perhaps exclusive, entrance to the Mediterranean and beyond.[12]

The second prize is oil. Without even considering what Russian needs are in this area, whether her reserves are adequate enough and cheap enough to sustain her in time of war, there can be no doubt about the effect on Western Europe of Russian capture of the oil wells of Arabia, Iraq, or even of the pipelines through the Levant. None of this oil, to be sure, is Egyptian; but Egypt now considers herself the guardian of Middle East resources, and regards the fact that half the world's oil comes from Aram lands as a bond and a weapon. Furthermore, as owner of the Suez Canal, Egypt now controls a westward flow "without which Europe's industry would turn back to naked metal, covered with rust."[13] This position too makes Egypt the envy of Russia.

Finally there is ideology. Egypt is useful to Russia as a former British colony which has thrown off imperialism and achieved a successful social revolution; Egypt is a rallying point against the West in other uncommitted countries; and Egypt serves as an example of a non-Communist country which can be shown to have gained much from Russian friendship without having been swallowed up by Russia. Egypt, in other words, is a potential spearhead for revolution, first in the Middle East, then in Africa and

Egyptian benefits from Russian friendship seem, at first glance, to be more immediate and practical. Since 1955, Egypt has received arms, loand, trade, technical assistance and not least moral support from the Soviet bloc. The pattern of Egyptian trade has completely changed as a result. In 1953 Egypt sold five times as much (by value) to Western Europe as to the Soviet bloc; by 1956 sales to the Soviet bloc - notably of cotton to Russia and Czechslovakia - exceeded those to Western Europe by 6 per cent, and Communist countries bought 57 per cent of Egypt's cotton during the season from September through December, 1957.[14] Until quite recently, Russia was paying so much for Egyptian cotton that other countries could not afford to buy it, and at the same time selling her own low-grade cotton to Western European countries. In return for these benefits, Egypt had to accept industrial products from Russia at extremely high prices, but the disadvantages, if such they were, of the bargain were largely mitigated by Soviet loans and technical assistance. Details of the most recent Soviet loan, made in January, 1958, have not been published, but it is believed to be equivalent to a sum of about $175,000,000, to be repaid at 2 1/2 per cent interest in cotton, agricultural commodities, and specie, and Egypt's Minister of Industry declared that as a result, "We have acquired all that we need to develop our industry."[15] This is doubtless an exaggeration, but even so, and despite the fact that most of the money will have to be spent on materials from Russia, it represents a considerable measure of assistance. Together with similar loans from other members of the Soviet bloc, and with Russian technical assistance - in geology mining, ore prospecting, metallurgical machine construction, electrical, textile, food and pharmaceutical industries, Soviet assistance has gone far to make Egypt independent of Western favor or disfavor.

Independence from the West is a goal in itself, and for this reason Russian financial, technical, and military assistance is more greatefully acknowledged by Egypt than its extent might appear to warrant. While the United States withdrew assistance toward the High Dam project, while the Western powers objected to the nationalization of the Suez Canal, while Britain and France took advantage of the Israeli war of 1955 to invade Egypt again; every Egyptian national advance has been cheered by Russia, and Soviet moral support has been perhaps as valuable as her material aid.[16] Furthermore, except for commitments to trade, there have been no visible strings attached to Soviet friendship. The Communist Party remains outlawed in Egypt. Russian claims that Moslems in the Soviet Union have freedom of religion and political autonomy are accepted in Egypt. "We dispatched some of our Islamic leaders to Uzbekistan," declared Nasser in a recent interview. "They visited Tashkent, Bukhara and Samarkand. They tell me Moslems there have full freedom to be Moslems.... We are giving Islamic libraries to Soviet mosques.."[17]

Egypt's recent history explains why she views every Western move with deep-seated suspicion and fear. With the Soviet Union on the other hand, her relations are relatively new; there are no old wounds to mar the faith of the present. There is absolutely no problem Egypt believes, or professes to believe, that Russian aid is given without ulterior motives. To quote again from Nasser: "There is absolutely no problem between the Soviet Union and Egypt. They have helped us greatly. They helped us with war supplies. When we faced great economic pressures and really needed aid, they gave it. Our money was

frozen in Britain and America; so we asked Russia for petroleum. They agreed at once. When you refused to supply us with wheat, they did. When we asked for a loan, they lent us 200,000,000 rubles."[18]

Whether one believes that there are strings attached or not - and it is doubtful that Nasser is as guileless as he sounds - it would be a mistake to assume from this catalogue of assistance that Egypt is friendly toward Russia in a positive sense. Egypt is not Communist and, as long as Islam remains the national faith, Communism on the Soviet model is unlikely. The great bond between Russia and Egypt is that both have an abiding distrust for the West, and can make common cause, within limits, against Western imperialism, against Israel, and, at times, against the United States. Egypt's "positive neutrality," then, is little more than a modern version of the old Arab proverb:
"The enemy of my enemy is my friend."

NOTES

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APPENDIX I. GEOLOGY

The dated geological history of Egypt began in the early Paleozoic with a prolonged period of denudation of the ancient igneous and metamorphic rocks that lasted well into the Mesozoic and resulted in the continental deposition of a heavy sandstone mantle. This process was followed by a series of subsidences and uplifts, continuing into the late Pliocene. During this period with recurrent invasions of the sea, the sediments which constitute some 50 per cent of the present surface of the country were laid down and the deep trench of the Nile valley was cut and partially filled.

The Ancient Rock Foundation

The ancient foundation – rocks of Archean age, mainly crystalline – is exposed over some 36,000 square miles, or about 10 per cent of the present land surface. A complex of igneous and metamorphic rocks, it consists mainly of granites, gneisses, and schists, with inclusion of a great variety of other rocks, and with veins and pockets of gold, silver, copper, iron, and other minerals. Marble, porphyry, serpentine, obsidian, and green breccia are some of the more important stones that have been quarried here for building and sculpture through the ages, but especially in Pharaonic times.

These ancient rocks appear in patches in the southern part of the country – especially in Mt. 'Uweinat region in the extreme southwest – and outcrops of them in the Nile valley account for the Nile cataracts. Their greatest exposure is the result of massive uplifts in the Red Sea region, where they form the principal constituents of the Red Sea Mountains and the mountains of southern Sinai. Granites predominate there, and because they are more resistant to erosion than are most of the other Archean rocks, the red granites account for some of the most prominent peaks and ridges. Mountain masses of later intrusives, such as dolerites, basalts, and gabbroids, are also of common occurrence.

The Nubian Sandstones

The denudation of the Archean foundation produced huge continental deposits of sands that reach in places to depths of over 1600 feet. These sandstones are by no means uniform in character, but range from hard to fairly soft and from whitish gray to dark brown. They also include occasional beds of grit, conglomerates, shales, clay, and marls, but are in general unfossiliferous. They are called Nubian Sandstones, from Nubia, the name applied in ancient times to the region extending from the First Cataract of the Nile southward into the Sudan. The same formation also extends westward across north Africa and eastward into southwest Asia.

These sandstones comprise nearly 30 per cent of the present land surface of the country and constitute most of the base on which the later marine and fluvial formations were laid down. In the south they form the characteristic undulating plateaus that culminate in the massive plateau of Gilf Kebir in the southwestern part of the Western Desert. In the southern Nile valley, which cuts across the plateau, the sandstones provided a convenient source of building stone. The temples of Karnak and Luxor and many other monuments of Pharaonic times are built of Nubian Sandstone.

In the Eastern Desert the Nubian Sandstone borders the western margin of the Archean massif of the Red Sea Mountains, and in southern Sinai it flanks the crystalline mass on the north. Structural deformation and stripping of the overlying rocks has also exposed this formation in a number of scattered localities, as in the oasis depressions of the Western Desert and in the basin of the Wadi Araba on the northwest side of the Gulf of Suez. Extending south of the Egypt-Sudan boundary for more than a thousand miles, the Nubian Sandstone is of great importance as a carrier of groundwater northward to the oasis of the Western Desert.

Major disturbances of this sandstone accumulation did not occur until the end of the Oligocene period, when the Red Sea and its bordering mountains began to take their present form and erosion began to carry off the sandstone cover. In the late Miocene and early Pliocene, stream cutting produced the gorge that has now been widened into the Nile valley.

The Carboniferous Marine Invasion

During the Carboniferous period, while the subaerial denudation of the ancient rocks was still going on, there was an extensive marine invasion. Toward the end of the Permian this was succeeded by a gradual uplift that continued until the Cretaceous.

The marine deposits brought to the surface by this uplift are known in two localities only, but their wide separation testifies to the extent of the invasion by the sea. One is on both sides of the north-central part of the Gulf of Suez; the other is in the Mt. 'Uweinat region in the extreme southwest corner of the Western Desert in Egypt.

The character of the deposits in Sinai west of the Gulf of Suez, where they are best developed, shows that there must have been more than one phase of the sea invasion and that subaerial denudation was concurrent with it. They consist of a lower sandstone series laid down on the crystalline base and without fossils of any sort; a series of fossil-bearing limestones on top of that; and finally, a second sandstone series with scattered plant remains of the Carboniferous type. Valuable deposits of manganese and iron are found in the limestone series. Turquoise-bearing joints in the upper sandstone series were worked by the ancient Egyptians.

The uplift continued to the end of the Jurassic, but the denudation of the ancient rocks went on until well into earlier Cretaceous times, and the resulting accumulations of Nubian Sandstone were carried northward by stream action into the shallow water of the sea. As a result of these accumulations there was some sinking of the land, but it was so gradual and slow that continental deposition was able to keep pace with it.

Subsequent Subsidences and Uplifts

Not until the latter half of the Cretaceous did the sea again make any really effective advance on the land. For millions of years thereafter, until near the end of the Pliocene, subsidences and uplifts alternated. Two more major invasions of the sea coincided with the Eocene and Miocene periods, and a minor invasion with the Pliocene.

The marine sediments laid down during these invasions are of enormous extent and thickness. Not only is each easily identified and distinguished by its characteristic index fossils, but between them are land and shallow-water deposits that were deposited in the intersubmergence periods. Striking evidence of the great extent of these deposits is furnished by the marine fossils, weathered from the solid rock in the form of delicate shells, and other remains of sea life that are strewn over the surface of the Eastern and Western deserts and central Sinai.

The Cretaceous Sea

The Cretaceous sea invasion was the most extensive of any to which the land of Egypt is known to have been subjected. Its calcareous beds are found as much as 600 miles from the present coast line of the Mediterranean, and reach thicknesses of as much as 600 feet.

The Cretaceous formations are a widely varied group consisting mainly of white chalk, shale, clay, and marly limestone. Although they are commonly soft, there are some hard limestone members. Bone beds, the source of Egypt's rich phosphate deposits, and nitrates occur in the shales.

Extensive as are these Cretaceous formations, they are exposed over only about 12 per cent of the present land surface of Egypt, mainly in the central and southern parts of the Western Desert and in Sinai, where they form the plateau of El Tih. In the Eastern Desert they appear west of the Red Sea Mountains in a broken belt between the Nubian Sandstone and the limestone of the succeeding Eocene period.

The Eocene Sea

The Tertiary began with another major sea invasion. A large part of the Cretaceous surface was submerged and in the course of millions of years, up to 2,300 feet of limestone series were deposited.

Of all the marine formations in Egypt, those left by the Eocene sea cover the greatest area — almost 20 per cent of the present land surface. Consisting of limestone with an abundance of nummilites, the characteristic Eocene fossils, they extend over most of the northern part of the Eastern Desert between the Nile valley and the Red Sea Mountains, forming the strikingly high plateau cut by the Nile valley for nearly 450 miles between Isna and Cairo. In Sinai they form the upper strata of the central plateau. The Eocene limestone has provided the bulk of the building stone used in the valley and delta. It was quarried from the Moqattam Hills east of Cairo for the Pyramids, and the Sphinx was carved from it.

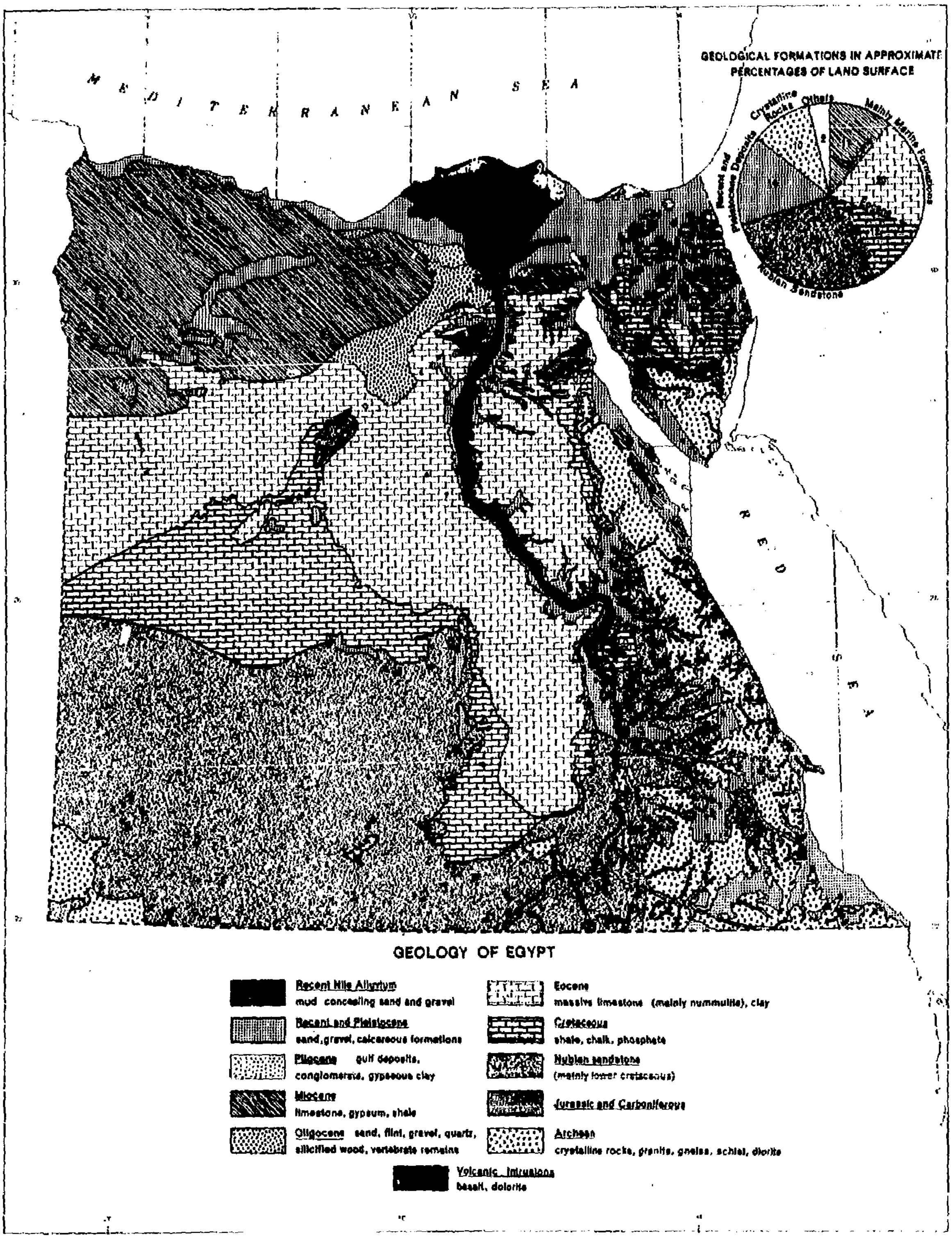
The Oligocene Uplift

The deposits of the Oligocene period are of estuarine and fluviatile origin and are composed chiefly of sandstone (the Gebel Ahmar sandstones, so-named from the mountain in the northern part of the Moqattam Hills, where they lie unconformably on the Eocene beds) and occasional beds of calcareous grit. They contain silicified wood and in the northern Faiyum depression, the remains of large land animals, including an ancestor of the elephant. These Oligocene deposits account for only about 1.5 per cent of the present land surface. The principal exposures occur in a section extending from the Faiyum to the Bahariya Oasis and in a broad band in the Eastern Desert between Cairo and Suez.

At the close of the Oligocene the Red Sea basin was formed and the uplifting of its bordering mountains was initiated. Volcanic and thermal activity accompanied the crustal disturbances, giving rise to basaltic intrusions that penetrated the Oligocene deposits. Conspicuous among these intrusions is that worked at the basalt quarries of Abu Za'bul, northeast of Cairo. Similar outcrops occur elsewhere in the old sedimentary rocks. The minor folds and faults in the Eocene limestone also date from this period.

The Miocene Sea

The beginning of the Miocene period was marked by subsidence much less extensive than those of the Cretaceous and Eocene periods. This subsidence was followed by a great uplift and intense crustal movement, which brought even the northern part of the country high above the sea and produced complex folds and faults. During this time the cutting of the trench now occupied by the Nile valley was initiated, to be completed in the early Pliocene.



GEOLOGY OF EGYPT

The Miocene formations occupy about 12 per cent of the present surface of the country, mainly in the northern part of the Western Desert plateau, where they reach a maximum thickness of about 1300 feet. They appear, also, in the hilly country that forms the northern edge of the Eastern Desert between Cairo and Suez. In these regions they are essentially of marine limestones, lower series of which alternate with estuarine facies of gravel, shales, and marly limestones.

Other Miocene strata of a different nature were deposited, in thicknesses up to nearly 1900 feet, near the coasts of the Gulf of Suez and the Red Sea. These are chiefly of gypseous materials and dolomitic limestone with veins of sulphur, although marls and shales are prevalent in the lower beds. Developed when the Miocene sea invaded the then-enclosed Red Sea depression, they were later subjected to much folding and faulting. Petroleum is found in commercially exploitable amounts in some of these beds, which are also the country's chief sources of gypsum and sulphur.

The Pliocene Sea

Although there were no major sea invasions after the late Miocene uplift, a subsidence during the Pliocene permitted the sea to advance as far south as the present head of the Nile delta and the Wadi Natrun west of the delta, and to flood part of the deep Nile trench and the Red Sea trough. The Pliocene ended with a major uplift. Oscillations in the relative level of sea and land during the Quaternary have been minor.

The Pliocene deposits, which occupy less than one per cent of the present land surface of Egypt, vary considerably in composition from place to place. Along the north shore and notably in the Wadi Natrun they are estuarine deposits of gypseous clay, sand, and gravel, with bands of limestone laid down during the latter part of the period. Along the Red Sea and in the lower Nile valley they are marine deposits of limestone, sand, and clay of mid-Pliocene date. In the upper valley they are mostly fluviatile conglomerates, gravels, clays, and sands.

The Red Sea Revolution

The Red Sea basin and its bordering mountains were formed at a relatively late date. As has been noted this part of Egypt did not begin to take on its present form until the Oligocene period. Before that time the ancient rocks of which these mountains chiefly consist had been subjected to so much denudation and deposition that their surface was reduced to an unbroken stretch of Nubian Sandstone, continuous with the present Arabian peninsula.

The present landscape of the region was shaped in Miocene and Pliocene times, starting with an immense anticlinal folding along an axis parallel with the present Red Sea. This brought the ancient rock mass to the surface and was associated with much faulting, the major fractures occurring in lines parallel to the present margins of the sea. The dropping of the crust in blocks produced the grabens now occuppied by the Red Sea and the Gulfs of Suez and 'Aqaba. The crustal disturbances were accompanied by volcanic activity and the formation of secondary faults and folds, which are responsible for much of the structural complexity of the region.

The uplifts raised most of the area to such a height that only the enclosed Red Sea depression was invaded by the sea in later subsidences. During the subsidence of the early Miocene the sea penetrated into this depression from the north by way of a depression now occupied by the Isthmus and Gulf of Suez, and the Red Sea basin became an arm of the proto-Mediterranean Sea.

The late Miocene uplift cut off the basin, but it was again connected with the sea during the subsidence of the early Pliocene, as revealed by deposits of Mediterranean origin in the marine beds laid down at this time in the Red Sea and Gulf of Suez area. Toward the mid-Pliocene the Strait of Bab el Mandab at the southern end of the Red Sea was formed, and the basin was thus connected with both the Mediterranean Sea and the Indian Ocean. Evidence of this is found in both Mediterranean and Indian Ocean fossil forms in upper Pliocene deposits of the Red Sea basin.

Crustal disturbances of the Red Sea region occurred for the third time during the great uplift at the end of the Pliocene. The mountains were pushed up to elevations higher than they had reached during the Oligocene and Miocene, with acute folding and faulting in many places. The denudation concurrent with and following this uplift bared the Red Sea and southern Sinai mountains of practically all their sedimentary cover. Only a few patches of it here and there have been preserved in local synclines.

From the late Pliocene through part of the Quaternary the sea level fell slowly, until, in the mid-Pleistocene, the Isthmus of Suez was again exposed.

The Forming of the Nile Valley

The Nile valley is the most recent major geological feature of Egypt. It bears no trace of Miocene deposits, and was evidently formed between the mid-Miocene and early Pliocene. Pliocene deposits found along its sides up to 600 feet above the present sea level indicate that during the mid-Pliocene subsidence the sea invaded an arm coinciding in outline approximately with the present valley and extending some 500 miles inland to the vicinity of the present town of Kom Ombo.[1]

The original valley was a deep trench in the massive tablelands composed mainly of Nubian Sandstone south of the Qena Bend of the river and of Eocene limestone north of this bend. In places, the valley floor lies 1000 feet below the plateau surface and no borings have reached the bottom of the deposits in the valley.

It is now commonly agreed that this gorge-like valley was cut by the river in the plateau surface, contrary to the theory, once widely advanced, of a rift valley or trough subsidence between two parallel faults. Only normal faults or slip faults are recognizable along the valley sides, and these are not sufficient to indicate a rift origin.[2]

The valley is generally considered to have been permanently formed during the uplift of the upper Miocene and the resulting retreat of the sea, with the river drawing its water from heavy local rainfall and runoff. Although some of this runoff may have come from the Nubian Sandstone plateau to the south, most of it probably originated in the Red Sea Mountains to the east, since it was during this time that the main wadis (stream beds now usually dry) that debouch on the valley from the east were developed.

The general course of the river, as it cut its way through what was previously a continuous tableland, was guided by a broad syncline trending generally south-north parallel to the Red Sea Mountains anticline to the east. The details of the river's course were determined mostly by a network of minor fractures and folds in the tableland structure. Particularly significant was the southwest-northeast fold of the Theban hills which governed the course in the Qena Bend.

Cutting was halted when the mid-Pliocene subsidence flooded the valley. Tremendous deposits filled this Pliocene gulf almost to water level. From its mouth, near the present location of Cairo, south about 100 miles to Biba, the outcrops show marine origin, with limestone, sand, and clay predominating, and contain characteristic fossils. As the sea withdrew in the upper Pliocene uplift, the river extended its course northward, leaving thick fluviatile deposits of gravel, clay, and sand, containing fresh-water shells, interbedded with estuarine formations of coarse gravel, quartz, sand, and travertine.

The river established its present valley on this Pliocene fill. As it cut down, it produced the series of gravelly terraces that stand 150 to 450 feet above the present flood plain.

In Pleistocene times Egypt had a period of heavy rainfall contemporaneous with the Ice Age in Europe. Torrential flow from the lateral streams (which created the wadis of the Eastern Desert) carried boulders, pebbles, gravel, and other debris into the main river. As the river continued to deepen its bed with its greatly augmented flow, it created the gravel terraces bordering the flood plain at heights of 10 to 100 feet, and carried the sediments on into the sea to form the basement of the present delta. Flint implements and other artifacts of early man have been found in these terraces.

Not until very recently, geologically speaking, did the Blue Nile, the White Nile, the Atbara River, and other central and upper tributary systems become an integral part of the Nile system and begin to lay down the alluvium that forms the upper beds of the Nile valley fill and the delta — thick beds of mixed gravel and coarse sand overlain with a comparatively thin layer of clayey silt. "Such studies as have been undertaken in connection with the deposition of river soil suitable for agriculture in the Nile Valley tend to indicate a date of approximately 14,000 B.C. as the one when it first began to be laid down."[3] Derived mainly from disintegrated volcanic rocks of the Ethiopian highlands brought down chiefly by the Blue Nile and the Atbara River during their annual floods, this silt forms the cultivable land of the valley and delta.

NOTES

1. K. S. Sanford and W. J. Arkell: Paleolithic Man in the Nile Valley in Nubia and Upper Egypt, *in* Prehistoric Survey of Egypt and Western Asia, Vol. 2, *The University of Chicago Oriental Institute Publications*, Vol. 18, 1933, pp. 8-10.

2. For the stream-erosion origin of the Nile valley see K. S. Sandford: Paleolithic Man in the Nile Valley in Upper and Middle Egypt, *in* Prehistoric Survey of Egypt and Western Asia, Vol. 3, *The University of Chicago Oriental Institute Publications*, Vol. 18, 1934, pp. 3-8. For the rift theory see A. C. Lawson: The Valley of the Nile, *University of California Chronicle*, Vol. 29, No. 3, 1927, pp. 235-259.

3. W. F. Hume: The Geology of Egypt, Vol. 2, Part 3, Cairo, 1937, p. 921.

APPENDIX II. CLIMATE

Since Egypt occupies a part of the great desert belt of northern Africa and southwest Asia, it is characterized by a pronounced continentality in temperature changes. Except in the Red Sea Mountains and the mountains of Sinai, the range of the average daytime temperature in January, the coldest month, is 65°-75° F. (18°-24° C.) and that of the night temperature 40°-50° F. (3°-10° C.). In July, the hottest month, the ranges are 90°-100° F. (32°-38° C.) and 65°-75° F., respectively. In the Red Sea Mountains and southern Sinai, elevation moderates these temperature ranges somewhat.

Throughout most of the country the proximity of the desert is made evident by the almost unbroken dryness of the air, the hot summers and cool winters, and the occasional heat waves and dust storms of late spring. Disturbances of varying intensity and extent occasionally occur in winter with the passage of the Mediterranean cyclones and in summer with depressions of desert origin. Otherwise the weather is remarkably stable and the rhythm of the seasons regular.

Summer and winter are the longest seasons. Winter is generally considered as running from November to March inclusive and summer from May to September inclusive. The advent of both is abrupt and the brief periods between them can scarcely be considered "seasons."

Maritime Influences

Whatever maritime influences there are on the climate come almost exclusively from the Mediterranean. The climate of the Mediterranean littoral contrasts markedly with that of the rest of the country. Lower temperatures, winter rains, and a somewhat damp, though rainless summer are the rule. There is some extension of the winter rainfall inland from the coastal belt, but precipitation decreases rapidly away from the coast.

The winter warming of the littoral by the Mediterranean has little influence inland, but its cooling effect in summer is occasionally carried some distance into the interior by prevailing northerly winds. Since the Mediterranean coast lies in the path of winter cyclones, these depressions may produce atmospheric disturbances far inland.

The Red Sea is markedly warm, experiences very little seasonal change, and is shut off from most of Egypt by the mountains. It has little effect, therefore, on land temperatures, except along the narrow coastal plain, where relatively high temperatures and humidity prevail most of the year.

The Influence of the Nile

The Nile produces a slight but noticeable variation from the true desert climate. The river, the many-channeled irrigation system, the land under irrigation, and the growing crops all serve somewhat to lessen its rigors. Over the valley and delta the temperature range is less and the humidity higher than in the bordering deserts at all times of the year, particularly during the summer flooding of the Nile. The variation is naturally greater in the delta, owing to the greater expanse of land under cultivation, the greater area in canals and lakes, and the delta's nearness to the Mediterranean.

Pressure and Wind

The prevailing wind in Egypt is northerly. Except for local topographic influences, the only major interruptions to the northerly direction occur in winter and late spring with the west-east passage of atmospheric depressions.

In winter most of Egypt is under the regime of the high-pressure system of North Africa. The center of this system extends into the western part of the country, with the result that while calm conditions prevail in the west the general circulation of the air is from the north and northeast.

Summer, when the air receives its maximum heat from the sun and is uniformly warm, is the most stable season. Low pressures prevail, owing to the great low-pressure system centered over southern Asia. Gentle northerly winds tend to blow toward the interior of the country from the Mediterranean, where the pressure is relatively higher, and become drier as they proceed inland over the heated land. No atmospheric disturbances occur, and the monotony of the unchanging, stagnant, warm air has a depressing effect as summer advances.

Autumn, normally limited to October, is a short transition period. As the land begins to cool, the high-pressure system, which in winter prevails over northern Africa and extends from Libya to western Egypt, moves in. Winds begin to blow from the north and northwest during this transition period, but they are occasionally interrupted by southerly winds which may bring brief heat spells.

Northerly winds prevail in winter throughout all but the northern part of the country. There they are interrupted, especially in December and January, by depressions moving from west to east along the Mediterranean basin. The passage of such a depression is the most conspicuous event in the weather of northern Egypt. Strong, southerly winds prevail, and occasionally bring cold weather from the desert interior, followed by a low, heavy overcast and showers with occasional thunderstorms. Winds then shift to the northwest and may reach gale force near the coast. Though of short duration, these gales bring alarmingly high seas.

Such a cyclone may last from a few days to a week, its intensity and duration depending on the depth of

the depression and the speed of its movement over the southeastern Mediterranean. Normally the path of the depression is along the coast and it has no effect south of Cairo, but occasionally its influence extends as far as Middle Egypt.

The Desert Cyclones

In spring (a brief transition period extending from late March to mid-May), pressure falls over the land and rises over the Mediterranean, but the dominating winds over Egypt continue generally northerly. Occasional desert depressions, known as *Khamasin*, much farther south than the coastal depressions of the winter season, draw in hot southerly winds, which stir up dust and sand storms and bring on hot, unpleasant weather.

Khamasin are characterized by hot, dry, dusty, southerly winds. Their advent is announced by a sudden blast of heat, with temperatures rising 15° to 20° F. (8°-11° C.) above normal, and a marked drop in humidity. During a severe khamsin, temperatures frequently exceed 110° F. (43° C.) and relative humidity often drops to 10. Winds may reach gale force, 60 to 70 miles per hour, causing severe sand storms in which the dust rises to thousands of feet, to be deposited hundreds of miles away. Visibility is reduced practically to the vanishing point. The excessive heat and the strong winds frequently damage crops, and sometimes trees are blown down, buildings damaged, and Nile shipping sunk.

Khamasin weather may last from one to five days, with maximum intensity in the late afternoons and relative calm at night. About ten khamasin occur annually, from March through June, with the most severe ones in April and May. These desert depressions encompass a much greater area than do the coastal depressions; they sometimes envelop most of Egypt.[1]

Temperature

Egypt is generally mild to cool in winter and hot in late spring and summer. In the coldest month the average temperature does not fall below 50° F. (10° C.); during the summer it is in the 80's F. (in the upper 20's C.). The daily range is high throughout the year – between 20° and 30° F., except along the Mediterranean coast, where it is between 10° and 15° F. It is coolest just before sunrise and hottest in the early afternoon. Night temperatures above 40° F. (4.5° C.) are common during the winter, while in summer day temperatures normally exceed 95° F. (35° C.). Near the Mediterranean coast, however, day and night temperatures are more moderate.

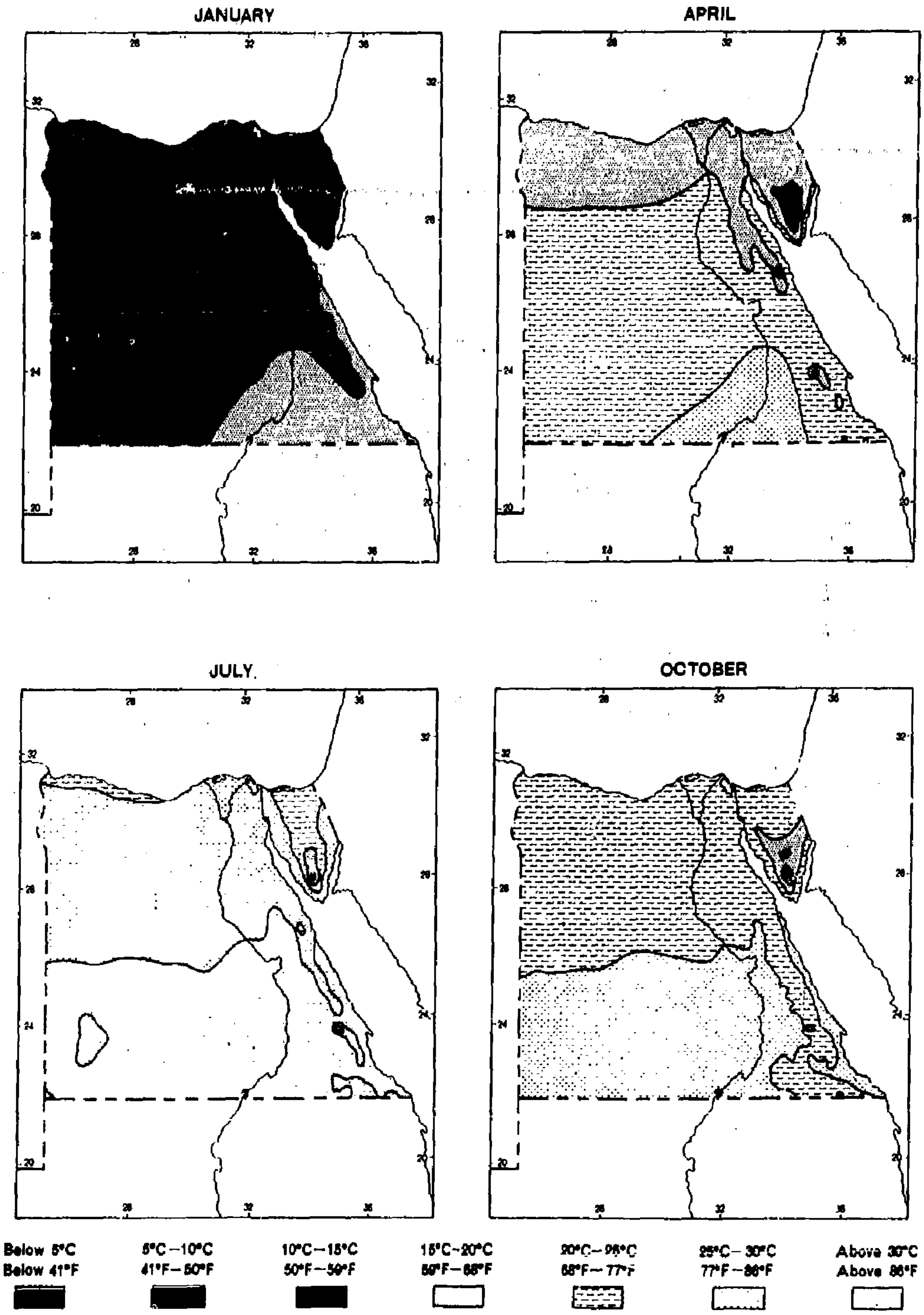
Winter. As winter sets in, temperatures throughout the country drop markedly and somewhat abruptly. November is mild and sunny, with mean temperatures ranging from 65° to 70° F. (18.3°-21° C.), while January is usually the coldest month, with the mean temperature range over most of the country 55°-60° F. (12.8°-15.5° C.), except on the Red Sea coast, where it is slightly higher. Average temperatures below 50° F. (10° C.) occur only in the highlands of Sinai where freezing is common, the Red Sea Mountains, and the uplands of the southwest.

Table 1 – Mean Day Maximum Temperatures (in Fahrenheit)

	J	F	M	A	M	J	J	A	S	O	N	D	Yr.
Alexandria	65.3	66.4	70.1	74.3	79.1	82.7	85.3	86.7	85.9	83.1	77.0	69.1	77.0
Port Sa'id	65.8	67.6	70.3	74.4	79.7	84.7	88.3	89.2	87.0	83.6	77.1	69.2	78.0
Suez	67.8	69.8	75.2	82.9	90.5	94.8	97.3	97.1	92.3	87.8	79.7	71.0	83.8
Tanta	67.8	69.6	74.8	82.7	90.1	93.7	94.6	94.4	91.0	86.7	79.1	70.7	82.9
Zaqaziq	67.6	69.4	74.6	82.4	89.4	93.5	94.8	94.1	90.3	86.7	79.1	70.7	82.7
Cairo	67.5	70.5	76.1	83.7	91.1	95.5	96.7	95.3	90.7	87.1	79.5	70.5	83.7
Faiyum	69.0	71.7	77.0	85.6	93.3	96.4	97.8	97.1	92.3	88.5	80.4	71.7	85.1
Minya	68.0	71.2	78.0	87.0	94.1	97.3	97.8	96.8	90.8	86.3	78.9	69.9	84.7
Asyut	68.2	72.2	79.9	88.7	95.9	98.8	98.9	97.9	92.7	87.1	79.9	70.9	86.0
Qena	72.8	77.5	86.9	95.5	101.8	105.8	105.8	105.2	100.5	95.1	86.1	75.9	92.4
Luxor	74.1	78.9	85.8	95.3	104.0	105.8	106.5	106.1	102.5	98.2	87.0	77.7	93.5
Aswan	74.3	77.9	86.7	95.7	102.9	107.1	106.3	106.0	102.9	98.3	87.1	77.5	93.5
Mersa Matruh	63.8	64.5	67.4	72.5	76.6	80.0	81.6	83.3	82.4	80.2	74.3	67.4	74.4
'Arish	65.3	67.6	69.8	75.0	80.4	83.4	86.3	87.0	85.1	83.1	76.8	69.2	77.3
Tor	69.4	71.0	75.7	82.0	88.1	91.7	93.9	94.1	89.0	84.7	79.3	72.5	82.5
Gherdaqa	70.8	72.3	76.8	83.1	90.1	93.2	94.4	95.0	91.4	87.2	80.2	74.1	84.0
Quseir	72.8	73.5	76.8	81.5	87.8	91.0	92.4	93.3	90.5	87.0	81.8	75.9	83.6
Siwa	67.4	70.8	77.1	85.6	93.5	99.6	100.5	100.2	95.3	89.9	79.8	73.9	85.8
Dakhla	70.7	75.2	82.7	92.1	99.6	102.7	102.5	102.0	97.3	92.3	83.1	73.2	89.4
Kharga	71.7	75.5	83.3	91.9	100.4	102.3	103.1	102.9	97.8	93.5	83.8	74.8	90.1

Source: Climatological Normals for Egypt, Meteorological Department, Ministry of War and Marine, Cairo, Egypt, 1950.

MEAN TEMPERATURE



While Upper Egypt has practically continuous mild, sunny weather throughout the winter, the delta and even Middle Egypt experience cold spells and periods of cloudy days owing to the passage of Mediterranean storms, which bring cold winds from the southwest. Winter in most of Egypt is too cool for comfort without warm clothing and some heat in the houses. Luxor and Aswan in the south, which have higher temperatures, are favorite winter resorts from November to March.

Summer. Hot weather begins early in Upper Egypt. Even in late April, a khamsin heat wave may bring temperatures to 95° F. (35° C.), and the average maximum day temperature exceeds that until well into, and frequently to the end of, October. Light, white summer clothing usually appears in April and is worn until well toward the end of October.

For most of Egypt July is the peak of the summer. Only along the Mediterranean is the temperature higher in August than in July. The mean July temperature in the southern half of the country is well above 86° F. (30° C.). Aswan, with a mean of 97.7° F. (33.2° C.) is one of the hottest spots in the Nile basin, though the Red Sea coastal plain has comparable temperatures. A temperature of 123.8° F. (51° C.) recorded at Aswan on July 4, 1918, is the highest known in Egypt.

To the north July temperatures are somewhat lower; the mean at Asyut is 84.9° F. (29.4° C.), at Cairo 81.9° F. (27.7° C.), along the Mediterranean coast in the upper 70's F. Coastal summer resorts provide a respite from the heat of the interior, which is greater than the mean alone would indicate. The average *maximum* day temperature for July is in the upper 90's F. (the middle 30's C.), and in Upper Egypt it exceeds 105° F. (40° C.). The wide span between the daily mean and the average maximum day temperature reflects the considerable fall in temperature at night.

High temperatures persist from mid-June to mid-September along the Mediterranean coast; from late May to well into September in Middle Egypt; and for seven months, from April to October in Upper Egypt. Away from the coast the heat is scorching, the air oppressively stagnant.

Still more uncomfortable, however, are spells of relatively high humidity and temperature in late July and in August and September. Otherwise practically cloudless, during these spells the sky is overcast with low clouds from dawn to a few hours after sunrise.

Humidity

The moisture content of the air and the degree of humidity are closely related to temperature conditions. The actual amount of moisture in the air is greatest in Egypt during the late summer, when evaporation is high, and least in winter. Except for the Mediterranean seaboard, however, the relative humidity is lower in summer than in winter. The highest humidity is to be found in the middle of the Nile delta during the winter months. There, at Tanta, the mean relative humidity in November, December, and January is 80 per cent. The humidity decreases rapidly from north to south; the mean relative humidity at Cairo in January and June is, respectively, 70 per cent and 61 per cent, at Asyut 69 and 42, and at Aswan 45 and 26.

The hot, dry khamasin winds of late spring and early summer often reduce the relative humidity below 10 per cent, and at Alexandria a relative humidity of only 2 per cent has been recorded during an intense khamasin.

Humidity is appreciably lower on the desert edges of the valley and delta than over the Nile and the cultivated land that it waters, particularly when the Nile is in flood. For example, the Cairo suburbs of Heliopolis and Helwan, on the edge of the irrigated land northeast and south, respectively, have much drier weather than does Cairo proper. Helwan, in particular, is noted as a health resort because of its dry air.

Table 2 – Mean Relative Humidity (in percentages)

	J	F	M	A	M	J	J	A	S	O	N	D	Yr.
Mersa Matruh	76	73	74	72	74	77	81	80	77	75	75	74	76
Alexandria	69	68	68	69	72	74	77	75	69	69	70	70	71
Port Sa'id	76	75	73	73	73	75	77	76	73	72	73	76	74
Qurashiya	85	83	80	70	64	65	70	75	78	81	85	86	77
Tanta	81	78	76	68	61	63	70	74	77	79	81	80	74
Cairo	74	68	65	58	52	55	61	65	69	72	74	76	66
Helwan	61	56	52	45	41	44	51	54	58	59	62	62	54
Asyut	69	62	54	41	36	37	42	46	55	62	67	69	53
Luxor	68	58	46	34	30	32	34	37	46	53	60	66	47
Aswan	45	40	32	27	27	25	26	29	33	35	40	45	34
Siwa	70	64	61	56	52	53	55	58	60	63	66	70	61
Dakhla	51	47	41	35	32	30	30	33	37	43	47	53	40
Suez	68	66	63	60	59	61	62	65	67	68	69	68	64
Quseir	56	54	52	52	52	50	52	51	53	56	58	57	54

Source: Climatological Normals for Egypt, Meteorological Department, Ministry of War and Marine, Cairo, Egypt, 1950.

Along the Mediterranean the humidity is high throughout the year, but summer is damper than winter. The effect of the moisture-carrying sea breezes is most pronounced during the warm season, and summer temperatures do not rise high enough to offset the resulting increase in the moisture content of the air. At Alexandria, for example, the relative humidity increases from 69 per cent in January to 77 in July, whereas at Cairo, although it is only about 130 miles inland from the coast, the relative humidity is considerably higher in January than in July, owing to the lower winter temperatures. In summer the pattern is reversed; from April to August Alexandria is much more humid than Cairo.

On the Red Sea the average humidity is fairly uniform throughout the year, with the air only slightly moister in winter than in summer. Since the temperature is always much higher than along the Mediterranean, the relative humidity is lower despite the greater moisture content of the air. At Quseir the relative humidity is 56 per cent in January and 52 in July.

A marked daily variation in the humidity in conjunction with the diurnal range of temperature is a common feature of Egyptian weather. As a rule the dampest time of the day is in the early morning, when the temperature is at its lowest point, and the driest time in the early afternoon, when the temperature is at its maximum. In July at Cairo, for example, an early morning minimum temperature of 71° F. (21.6° C.) accompanies a relative humidity of 89 per cent, while in the afternoon the temperature rises to a maximum of 96° F. (85.5° C.) and the relative humidity drops to 35 per cent.

This variation is greatest in the interior and comparatively slight along the Mediterranean and Red Sea coasts. At Alexandria the average diurnal range of the relative humidity in January is 13 per cent (maximum 74 per cent, minimum 61) and in July the same (maximum 82, minimum 69); at Cairo it is 35 per cent (maximum 83, minimum 48) and 48 (maximum 83, minimum 35), respectively, for these months; at Aswan it is 27 (maximum 56, minimum 29) and 18 (maximum 35, minimum 17).

Convection is also a significant factor in the diurnal range of humidity, particularly during the hot season, since it causes moist air near the ground to rise and mix with drier air above.

High humidity is most oppressive when it is combined with high temperature and stagnant air. The high relative humidity of winter throughout the interior of the country is, consequently, much more comfortable there than is the lower humidity of the summer months, while the high humidity along the Mediterranean in summer is stifling. At Alexandria during July and August the daily sensible temperature (that is, the wet-bulb temperature, a convenient index to the degree of heat actually felt by the human body) frequently exceeds 75° F. (24° C.), which is 15°-20° F. above that which is considered most comfortable for the human body. This damp weather usually lasts for weeks with little variation, except for minor respites from sea breezes, and may extend throughout the valley and delta in late summer. At Cairo the sensible temperature is then as high as that at Alexandria and is even more uncomfortable, since the air is stagnant. Along the Red Sea coast oppressively damp weather prevails throughout the summer, with sensible temperatures exceeding 80° F. (26.6° C.).

Sunshine and Cloudiness

Egypt is predominantly a fair-weather land. The daily duration of sunshine ranges from twelve and a half hours in summer to seven hours in winter and averages ten hours a day for the whole year. During the warm season clear skies prevail almost uninterruptedly throughout the country. So continuous is the sunshine that it becomes oppressively monotonous, especially since the flat surface of most of the country and the bright desert sand produce a constant glare. Only during the winter can the weather ever properly be described as cloudy, and even then cloudy weather is only common along the Mediterranean. There the winter sky is often partly cloud covered, especially at midday. During a rainstorm the sky is apt to be completely overcast, and the dull, gray cover may persist for several days. But even at the peak of the period of maximum cloudiness, there is more sunny than cloudy weather.

There is some early morning fog along the Mediterranean in winter, but it seldom persists long after sunrise. At Alexandria these winter-morning fogs average about five a month. In the delta and the valley a thick mist sometimes rises in the early morning, but begins to dissipate soon after sunrise.

Precipitation

The rainfall of Egypt is at most meager, although there are occasional local heavy downfalls of brief duration in the north, the Red Sea Mountains, and Sinai. With only 7.6 inches (193 mm.), the Burullus lighthouse, on the most northerly tip of the delta, has the heaviest average annual rainfall of any station in the country. The rainiest part of Egypt is a narrow strip along the Mediterranean Sea (see Table 3),[2] but there is considerable variation from station to station, owing to differences in orientation to the rainbearing northerly winds. At Alexandria the average annual rainfall is 7.36 inches (187 mm.), while Mersa Matruh and Salum, on the coast west of Alexandria, have 6.32 inches (160 mm.) and 4.28 inches (108 mm.) respectively. At coastal stations east of Damietta rainfall declines to less than 4 inches (101 mm.); at Port Sa'id it is 3.16 inches (80 mm.) and at El 'Arish 3.88 inches (98 mm.).

Even in the delta the rainfall decreases sharply at a very short distance from the coast. At Tanta, in the middle of the delta, the average annual fall is 1.96 inches (49 mm.). At Cairo it is only 1.04 inches (26 mm.), and from there southward it diminishes progressively and rapidly to practically none at all in the far south. At Asyut the annual average is 0.28 inches (4.5 mm.) and at Aswan 0.12 inches (3 mm.). Almost no rain falls on the Red Sea coast; the annual average at Quseir is 0.16 inches (4 mm.).

Snow is practically unknown in Egypt, except on the highest peaks of the mountains of southern Sinai and the Red Sea Mountains, which are often snow capped for short periods in winter. Some snow has been reported along the coast in exceptional cold spells. Dew forms at night in all seasons. It is heaviest in the winter months in the valley and delta and in the summer along the Mediterranean coast. Summer dew plays a significant role in sustaining desert vegetation in the coastal belt.

Most of the rain falls between November and February, with the maximum during December and January. Rain is rare in spring, although an occasional thunderstorm with some rain and even hail may develop in May and early June with the passage of desert depressions. During the greater part of June and from then on to the end of September only a few of the coastal stations ever record any rain at all.

Thunderstorms associated with the winter passage of atmospheric depressions along the Mediterranean coast are the source of most of Egypt's rain. Light rain, preceded by low, dark clouds with thunder and lightning, is usually the rule. But there may be heavy rain with the more severe storms, and when there is, there is often hail as well. In the coastal area about seven thunderstorms are the average during the rainy season; southward from the coast the number decreases rapidly. Along the coast most of these storms occur during the night; inland their occurrence is usually around sunset.

There is considerable variation in the amount of rain from year to year, owing to variations in the frequency and intensity of the storm-bearing depressions. Extremes range from four times the annual average to no rain at all. Records of the Alexandria station up to 1945 show a maximum annual rainfall of 15.48 inches (393 mm.) and a minimum of 2.04 inches (51 mm.). At Cairo the corresponding records are 3.24 inches (82 mm.) and 0.28 inches (7 mm.). In some of the heavier storms a phenomenal amount of rain may fall in a brief period. At many places on the Mediterranean coast 3 to 5 inches have been recorded in a single storm and 2 to 3 inches in one twenty-four-hour period. In October, 1937, half an inch of rain fell in Cairo in five minutes.[3]

Heavy rainfall often causes damage. With cultivation in the delta and valley geared to a carefully controlled system of irrigation, a sudden downpour of rain can do serious harm to crops and wreck the layout of fields and irrigation ditches. The mud dwellings of the rural villages have been known to collapse and lives to be lost. The dirt roads which are the most common in Egypt become impassable. Urban centers, with their flat-roofed buildings, unpaved streets, and drainless lanes, are equally vulnerable.

The worst disasters result, however, from the sporadic but heavy rainstorms which occur occasionally in the barren highlands of the Eastern Desert and Sinai. Water from a heavy rain, rushing down from the hills, accumulates in muddy torrents in the wadis. Not only are these torrents an ever-present menace to nomad encampments in the wadis, but in the wadis which open to the Nile valley torrents may completely demolish settlements at the mouths of the wadis along the edge of the cultivated land. At times they even reach the Nile itself, discoloring its water with their loads of sand and silt.

The rainfall of Egypt has little significance for the agriculture of the valley and delta, except when it may be so heavy as to damage crops or delay spring planting. But it may be of vital importance to the nomads and seminomads of the deserts. On the coastal plain west of Alexandria the annual rainfall supports some pasture and permits some cultivation of winter crops — mainly barley. Goat pasturing, however, has denuded the land, so that much of the rain, especially that which accumulates in the wadis in flash floods, drains off quickly to the sea.

Table 3 – Mean Rainfall (in inches)

	J	F	M	A	M	J	J	A	S	O	N	D	Yr.
Salum	1.04	0.92	0.40	0.12	0.08	0	0	0.04	0	0.16	0.56	0.96	4.28
Mersa Matruh	1.64	1.00	0.52	0.12	0.08	0	0	0	0.04	0.56	1.00	1.36	6.32
Alexandria	1.96	0.96	0.40	0.12	0.08	0	0	0	0.04	0.24	1.32	2.24	7.36
Burullus	1.92	1.48	0.64	0.20	0.08	0	0	0	0	0.24	1.36	1.68	7.60
Damietta	1.08	0.80	0.40	0.12	0.08	0	0	0	0	0.28	0.60	0.72	4.08
Port Sa'id	0.72	0.48	0.36	0.24	0.12	0.04	0	0	0	0.12	0.44	0.64	3.16
'Arish	0.72	0.72	0.56	0.24	0.08	0	0	0	0	0.20	0.60	0.76	3.88
Tanta	0.36	0.36	0.16	0.16	0.16	0	0	0	0	0.24	0.20	0.32	1.96
Cairo	0.20	0.16	0.16	0.08	0.08	0	0	0	0	0.08	0.08	0.20	1.04
Asyut	0.04	0.04	0	0	0.04	0	0	0	0	0	0.08	0.08	0.28
Aswan	0	0	0	0	0.08	0	0	0	0	0.04	0	0	0.12
Siwa	0.04	0.04	0.04	0.04	0.08	0	0	0	0	0	0.04	0.12	0.40
Suez	0.08	0.08	0.16	0.08	0.08	0	0	0	0	0.08	0.20	0.16	0.84
Quseir	0	0	0	0	0	0	0	0	0	0.04	0.08	0.04	0.16

Source: Climatological Normals for Egypt, Meteorological Department, Ministry of War and Marine, Cairo, Egypt, 1950.

The Egyptian-American Desert Range Projects of the Point-4 program has undertaken experimentation in the conservation of rain water in the neighborhood of Ras el Hikma, east of Mersa Matruh. The wadis have been dammed so that their discharge is spread out over the land, and grasses selected from some 300 species tested in experimental plots have been planted. Goats are kept off the newly seeded land, at least until the grass has taken hold. The experiment has been sufficiently successful to make it possible to institute a program of controlled year-round grazing on a 25,000-acre tract, and the team of Egyptian and American experts that has been directing the work has estimated that as much as 4,000,000 acres of rangeland along the seaward edge of the Western Desert can be similarly reclaimed at a cost of about $15 per acre.[4]

The meager and sporadic rains provide some pasture for the flocks of the nomads in the northern part of the Western Desert immediately south of the coastal belt, and supply the precious water of the few wells. There every hollow among the sand dunes that can hold water and every rock pit serves an important purpose as a possible reservoir.

The conservation of rain water in cisterns and behind dams across wadis in the Eastern Desert and Sinai also offers considerable possibilities for storage. A dam was completed in Sinai early in 1947 across the lower part of the Wadi el 'Arish at Rawafa, about 30 miles south of the town of El 'Arish. The water stored by this dam is used for drinking and general household purposes and for irrigation in a number of nearby settlements. Immediately after the dam was completed, in March, 1947, heavy rains yielded an estimated 6,000,000 tons of water. The amount available for storage varies of course, from year to year.[5]

NOTES

1. M. G. Elfandy: The Formation of Depressions of the Khamsin Type, *Quart. Journ. of the Royal Meterorol. Soc.*, Vol. 66, No. 286, July, 1940, pp. 323-336.
2. Compiled from Climatological Normals for Egypt, Meteorological Department, Ministry of War and Marine, Cairo, 1950
3. L. J. Sutton: The Climate of Egypt, Cairo, 1924, p. 41.
4. New York *Times*, April 14, 1955.
5. Sutton, *op. cit.*, pp. 59-62.